Market Analysis and Planning Services (MAPS)

Information Services Industry Specific and Cross-Industry Markets

Volume 3

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Market
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U.S. Information Services Industry-Specific Markets, 1987-1992

Utilities Sector

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DECEMBER 1987

U.S. INFORMATION SERVICES INDUSTRY-SPECIFIC MARKETS 1987-1992

UTILITIES SECTOR

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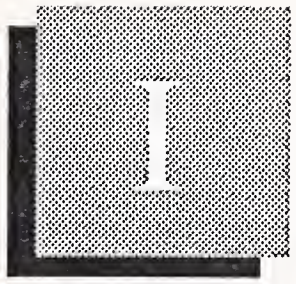
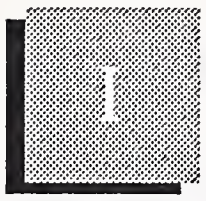


Issues, Trends, and Events



Issues, Trends, and Events

A Definitions and Applications

INPUT divides the utilities market into three major segments:

- Electric.
- Gas.
- Water and sewage/waste disposal.

Telephone and telecommunications utilities are discussed in the telecommunications section.

Electric utilities are divided into five classifications:

- Investor-owned (those utilities with publicly traded stock).
- Cooperatives.
- Municipality-owned.
- Federal-owned.
- State projects/power districts.

The three primary types of gas utilities are:

- Transmission.
- Distribution (local gas utilities).
- Municipal companies.

Water utilities are divided into:

- Public or municipality ownership.
- Private ownership.

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"Sewage and waste disposal services" completely describes this market segment.

Administrative computing applications encompass:

- Utility billing/meter reading.
- Customer service.
- Cost allocation services.
- Property records.
- Inventory management.
- Management reporting.
- Cash management.
- Route management and analysis.
- Meter reading.

General "operations" computing applications include:

- Outside plant mapping.
- Process monitoring and control.
- Simulation of system usage.
- Construction and contracting.
- Equipment fault/success analysis.
- Pipe network engineering.

Specific electric utility operation computing applications include:

- Piping layout and analysis.
- Network configuration and analysis.
- System state measurements, calculations, and analysis.
- Switching-surge insulation performance assessment.
- Load loss statistical calculations.
- Schedules for thermal unit and gas turbine operations.
- Electrical system topology.
- Generating capacity planning.

Gas utility operating computing applications include:

- Gas supply balancing.
- Pressure/flow simulation.
- Capacity planning.
- Inside plant mapping.

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Water/waste utility operating computing applications encompass:

- Pressure/flow simulation.
- Inside plant mapping.
- Capacity planning.
- Environmental hazards monitoring and reporting.

B

Issues

Utilities' computer usage is diverse. The use of computers for financial and administrative applications differs significantly from computer systems used for operations.

- Financial and administrative applications software combines business-oriented information with state and federal regulatory compliance.

- Computer systems used in the operations side of utilities combine real-time process and control applications with engineering and technical simulations.

- As a result, few hardware vendors can provide a single hardware system to meet utilities' data processing requirements.

Electric utilities experience increased competition from gas utilities selling alternative energy sources and some large commercial customers who have installed cogeneration systems. Therefore, electric utilities are developing data bases of customer information to improve marketing efforts.

Cost containment has always been a major issue and will continue as one. Industry sales were basically flat in 1987, which will sustain the pressure to control costs.

Large public utilities that are under less severe cost pressures have issues and objectives encompassing data administration, formalizing end-user support organizations, and taking a more active role in the corporate planning process.

Competition has caused utilities to begin to pay more for data processing expertise. A recent survey showed that utilities pay 11% more than the average for IS personnel.

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The purchase of departmental minicomputers and fourth-generation application development tools by end-user departments is changing the IS role to one of data manager and coordinator. Additionally, corporate IS can continue to help with cost justification of systems for end-user departments.

The federal government is gradually deregulating prices for electricity and natural gas, adding pressures on utilities to learn how to effectively compete, market their products, and perform like other private sector companies.

Utilities have always dealt with government regulations. However, "enlightened" utilities are learning to work with regulatory agencies in an effort to get necessary rate increases approved and receive these increases in a timely manner. Under the Reagan administration, the regulatory environment may have softened somewhat.

Interest rates directly affect utility operating costs. The high interest rates of the early 1980s dramatically increased the cost of capital for necessary improvements and plant additions and especially slowed the building of non-nuclear facilities.

As a result of decreasing oil prices since 1984, fuel oils offer strong competition to gas and electric utilities as alternate fuel sources. For new construction, builders and architects, through their designs, influence fuel consumption patterns in the short run by selecting one fuel source over another.

Hardware and software obsolescence will impact many utilities. Basic commercial applications (billing, financial reporting, accounts payable, accounts receivable) need to be upgraded and integrated.

- New billing and payment systems that take advantage of technological advances such as pay-by-phone and frequency-emitting meters are being developed.

- Engineering and operation systems are being integrated with modeling systems to project capacity requirements.

Administrative software modules are being integrated whereby one keystroke can transfer the data entered to all system modules requiring that information. Dividing a large application into smaller modules also

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breaks a high-value sale into a series of smaller ticket sales, a valuable marketing tool for an industry with tight data-processing budgets.

Senior management at utility companies, selected generally for good day-to-day operations backgrounds, are beginning to use information as a competitive and strategic weapon.

Growth will occur in:

- Mainframe- and minicomputer-based operations and technical applications.

- Microcomputer-based business and operations applications.

C

Trends in Electric Utilities

Electric utilities have substantial excess generating capacity and construction is limited to completion of plants already underway.

Readily available excess electricity, made possible by cogeneration, has three interrelated effects:

- It has lessened the need to expand capacity.

- It has led to increased selling and buying of excess electricity.

- It has led to increased competition in selling electricity to municipalities and large industrial customers.

For the past two years, cost overruns in nuclear power plant construction have forced budget austerity. These budget cuts have affected the rate at which IS management has purchased or written software for new applications.

D

Trends in Gas Utilities

Conservation efforts, begun in the 1970s, indelibly changed the natural gas industry. Industrial consumption of natural gas, which decreased 20% since 1973 for commercial customers, will decrease 5% per year through 1991.

Fortunately, this decrease is offset by the steady increase in natural gas use among the natural gas industry's top three customers – retail trade, real estate, and service organizations. Natural gas consumption by these

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three market segments, accounting now for 50% of total U.S. gas consumption, is expected to grow 5-10% annually through 1991.

The overall share of natural gas sold to commercial accounts under "special conditions" (i.e., at a discount) has decreased from 42% to 39% of total natural gas consumption, a positive trend for the gas industry.

Programs for recycling refuse into natural gas have begun and are successful on a relatively small scale. The technology challenge is to economically increase the scale and scope of refuse conversion.

Declining prices for natural gas and oil have resulted in reduced industry profits; hence, there is further pressure on IS to curtail or delay capital spending. Alternative fuels such as low- and high-sulphur heating oil are less expensive. Therefore, users tend to purchase these fuels before natural gas.

E

Trends in Water and Waste Utilities

Demand by homes and industry for water and waste services will steadily increase through 1991.

Hazardous-waste disposal and monitoring is becoming a more important application as a result of the current level of interest by state and federal legislatures and the public.

F

Events

Public utilities (i.e., those with stockholders) are diversifying their business base to lessen earnings dependence on a single business. INPUT has identified the following diversification targets: real estate development, venture capital, financial services, retailing, and computer services.

In 1986, Pacific Lighting (Los Angeles, CA) acquired drug store chain Thrifty Corporation (Los Angeles, CA).

Portland General Electric (Portland, OR) has entered into real estate ventures (with Weyerhauser Corporation of Tacoma, WA), airplane leasing, and venture capital.

Mergers and acquisitions are likely to increase, and will result in larger but fewer utilities, especially electric. The recent takeover attempt at Public Services of New Hampshire, using senior debt to gain effective control, could be a forerunner to more outside investor takeover of debt-plagued utilities.

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Philadelphia Suburban Corporation (the holding company for Philadelphia Area Water Company) acquired two computer software and services firms:

- Stoner Associates, Inc. (Carlisle, PA), a supplier of applications software for the utility market utilizing Prime minicomputers and IBM mainframes, was acquired in January, 1985.

- Philadelphia Suburban Corporation also acquired Digital Systems, Inc. (Columbia, SC), a supplier of DEC-based turnkey systems to electric/gas/water/waste utilities.

G

Factors Limiting Growth

Factors that have held back growth in the utility information services market include:

- Operations-oriented, rather than strategic-oriented, senior management that emphasizes cost cutting as opposed to using information as a competitive weapon or service differentiator.

- Mainframe-based, batch-oriented administrative and financial software that has been insufficient to accomplish basic tasks, consequently lessening the demand for more costly industry-specific solutions.

- Sales of minicomputer-based turnkey systems for plant operations (these systems do not have integrated hardware or software) increased rapidly following the problem at Three Mile Island but have slowed considerably in the past two years.

H

Factors Spurring Growth

Automation of repetitive tasks, such as meter reading, happened slowly in the utility business. Recently, many utilities are adopting hand-held meter-reading devices, which can automatically check for validity of data, store the data from hundreds of readings, then forward the data to the accounting mainframe for processing customers' bills.

Industry associations for electric, gas, and water/waste utilities are increasing their roles by adding on-line data bases through the association's computer or public on-line data bases, which include information on:

- Rates.
- State government elected representatives.

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- Federal lawmakers and regulatory agency personnel.
- Consumer demographics.
- Business demographics.
- Status on key legislation.
- Headlines and news briefs from industry periodicals.
- Federal energy regulations.

Microcomputer-based applications, especially those designed for utility districts serving 40-500 customers, will spur sales of computer software.

Increases in the number of computer simulations, already proven cost-effective, will increase demand for specific applications available on supercomputers or the new minisupercomputers. Since each supercomputer system costs more than $15 million, processing/network services that sell time to users on these systems represent more cost-effective solutions than user purchase of the hardware and software.

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III

Market Forecasts

II

Market Forecasts

A Introduction

INPUT divides the utility market into three segments:

- Electricity.
- Gas.
- Water and waste disposal.

The SIC (Standard Industrial Classification) for this market sector is 49 (491-497), which includes:

- Electric services.
- Gas production and distribution.
- Combination electric and gas and other services.
- Water supply.
- Sanitary services.
- Steam supply.
- Irrigation systems.

The number of utility companies in the U.S. in 1986 is shown in Exhibit II-1, and the number of utility company employees as of 1986 is depicted in Exhibit II-2. All but 2,000 utilities (privately-owned water utilities) are candidates for some level of computerization. These 2,000 privately owned water companies, generally located in rural areas and serving fewer than 40 customers each, are sufficiently small that computerization may be uneconomical.

The utility market appears relatively homogeneous. Information requirements for administrative computing at electric utilities should be similar to those of gas or water/waste utilities. Operations computing require-

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EXHIBIT II-1

NUMBER OF UTILITIES IN U.S. BY TYPE
1986

TYPE	NUMBER OF UTILITIES
ELECTRIC*	
• Investor-Owned	218
• Cooperatives	1,055
• Municipalities/Publicly Owned	1,900
• Federal-Owned	9
• State Projects/Power Districts	91
Total - Electric Utilities	3,273
GAS**	
• Transmission	150
• Distribution (Utilities)	450
• Municipal Companies	750
Total - Gas Utilities	1,350
WATER†	
• Public/Municipalities	18,000
• Private Ownership	6,000
Total - Water Utilities	24,000
SEWAGE AND WASTE DISPOSAL ††	
• Sewage Services	5,000
• Combined Services	340
Total - Sewage and Waste Disposal Utilities	5,340
Grand Total	33,963

*Source: Edison Electric Institute

**Source: American Gas Association

†Source: National Association of Water Companies

††Source: Sales and Marketing Management Magazine

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EXHIBIT II-2

NUMBER OF EMPLOYEES BY TYPE OF UTILITY, 1986

UTILITY	TOTAL EMPLOYEES
Electric	686,000
Gas (Production and Distribution)	230,000
Combination Utility Services	110,000
Water	105,000
Sanitary Services	55,000
Total	1,186,000

ments are fundamentally similar, the key exception being government reporting requirements for electric utilities with nuclear power plants.

In reality, a utility is built around its people. No two utilities approach the business in the same manner. As a result, some level of software customization is always required.

B

Demographic Forecast

As a result of merger activity, the number of electric utilities will decline slightly between 1987 and 1992.

- Competition from alternate power sources, such as wind and solar, will force electric utilities to become even more efficient.
- Effective utilization of existing facilities may require some consolidation to meet changing economies of scale.
- To meet these new economies of scale, most mergers and consolidations will be among small- and medium-sized electric utilities.

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- The consolidated utilities will be located near one another and may serve customers in more than one state.

The number of gas utilities will remain relatively constant, assuming very few mergers among medium and smaller gas utilities.

The number of water districts will also remain constant, assuming a minimum of merger and acquisition activity.

The number of combined sewage and waste disposal operations will hold steady for the next five years since these operations are also relatively mature businesses.

C

Electric Utilities

Although there are only about 3,000 electric utilities, expenditures for software and services by this segment account for approximately 55% of total utilities data processing expenditures.

The administration and accounting functions at the largest public electric utilities (i.e., utilities with publicly traded stock) are heavily mainframe-based, batch-processing-oriented. Large electric utilities, which have been converting to on-line transaction-oriented customer service systems, account for approximately 40% of total utilities data processing expenditures.

D

Gas Utilities

Information services expenditures by the 1,350 gas utilities account for 25% of total utility sector IS expenditures.

Production of synthetic natural gas (SNG) or methane from garbage and other waste materials is increasing the available supply of natural gas.

- More production and monitoring hardware and software will be necessary to support this burgeoning technology.

- More applications software for simulating SNG plant design and transportation and storage will be required to support utilities. Furthermore, the growing number of municipalities determining the feasibility of converting effluent from waste water treatment to methane generation require software to aid in their analyses.

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Gas utilities will install hardware and software for improved gas transportation and storage monitoring.

E

Water, Sewage, and Waste Disposal Utilities

Similar to other utilities, water and waste utilities must improve asset management. Software to help allocate people, vehicles, heavy equipment, and computers and yielding an immediate, measurable return is desirable.

F

Total Industry Forecast, 1987-1992

From a base of $698 million in 1987, industry expenditures will grow at a rate of 15% during the 1987-1992 period, to $1.41 billion in 1992.

Individual applications not requiring interface with the administrative mainframe or minicomputer will increasingly run on a PC.

G

Processing Services

As more organizations convert from minicomputer- to microcomputer-based solutions, processing services will grow more slowly than overall computer services in the utilities market. Revenues of $154 million in 1987 will grow to $255 million in 1992.

- Note, however, that INPUT's IS spending forecast does not portend a negative growth rate. Rather, it indicates slower than average growth.

- Many utilities, satisfied with the level and quality of processing service and not willing to hire and manage staff, will maintain the status quo relationship with processing services.

- As processing services move from batch to interactive processing and install the expensive, full-function software required to completely manage a utility, more utilities will migrate to processing services rather than compete for data processing administrative, programming, and operations staff.

The facilities management growth rate is declining, to 12%, due to the proliferation of minicomputer- and microcomputer-based turnkey systems. Revenues of $23 million in 1987 will grow to $41 million in 1992, as shown in Exhibit II-3. However, many medium and large utilities wanting to avoid hiring, training, and management problems will remain loyal to facilities management services.

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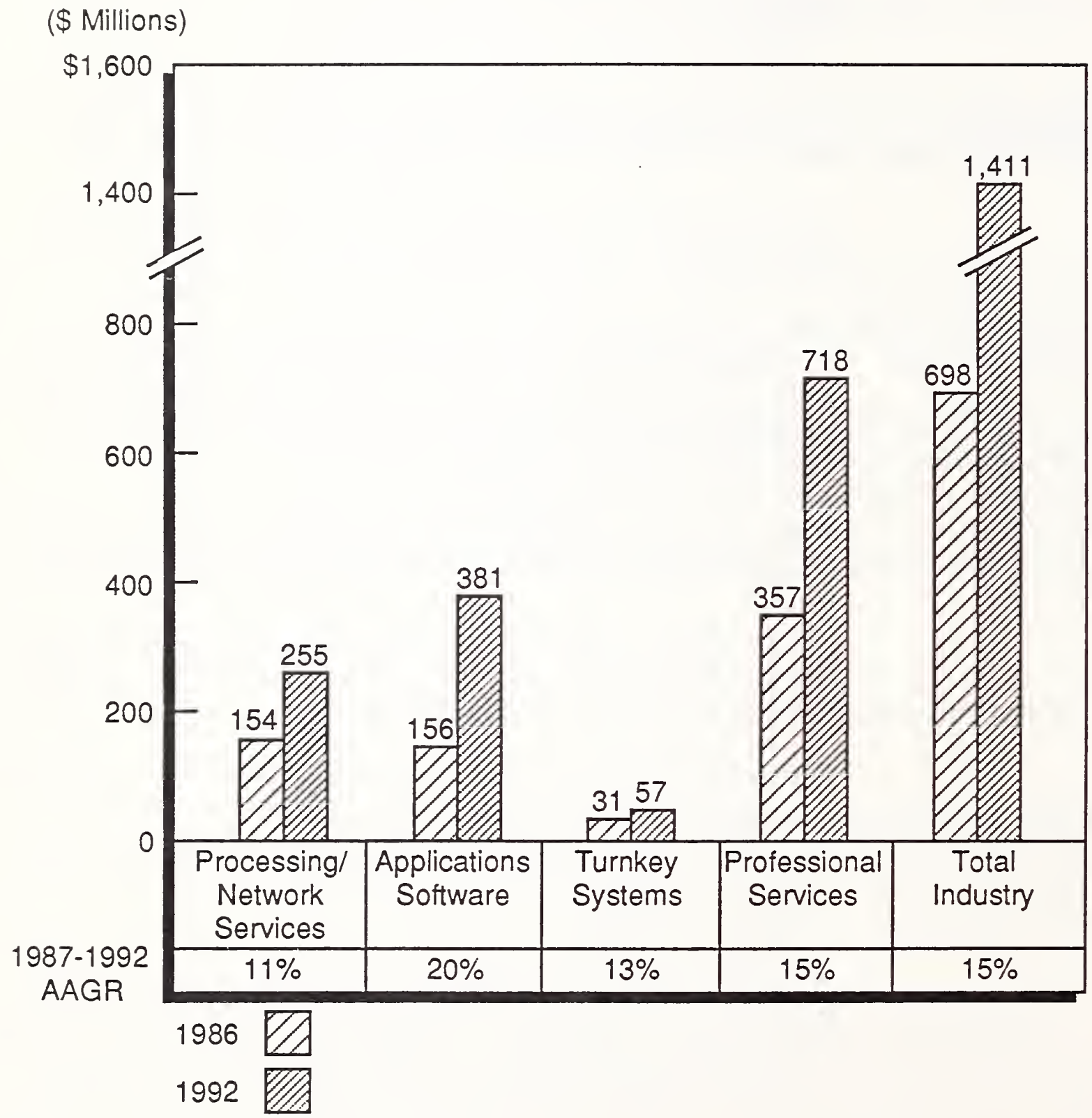
EXHIBIT II-3

UTILITIES SECTOR FORECAST
INDUSTRY-SPECIFIC INFORMATION SERVICES, 1987-1992



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Concerns for safety arising out of the Three Mile Island operating problem have led to a steady increase in disaster recovery services, much of which are processing service based.

To retain customers, many remote computing services now offer micro-to-mainframe communication links. This trend will continue.

H

Turnkey Systems

Turnkey systems, especially microcomputer-based systems, will grow at 13%. Factors stimulating this growth are:

- Certain administrative functions, such as gas transmission analysis or vehicle maintenance management and scheduling, can be initially implemented on a microcomputer and sold as a turnkey system.

- Existing micro-based applications can be networked or set up to run on multiuser micros or minicomputers. Turnkey systems, with single-supplier accountability, represent a competitive alternative.

- UNIX- or Pick-based technical or commercial applications, which were initially written for a minicomputer and are becoming more popular, can be easily ported to a microcomputer.

The new 80386 microprocessor will soon open up a new class of computers offering highly competitive price/performance. While new software must be written to accommodate these machines, this is an opportunity for improved operating systems, better user interfaces, and, most importantly, integrated applications software.

I

Applications Software

Mainframe and minicomputer-based applications software will grow at 20%, the fastest-growing market segment for all utility-related computer services. The factors influencing the growth of the market are more important than those factors impeding market growth.

Factors influencing the growth of mainframe/mini-based software for utilities include:

- Integrated software modules.

- Growth in ownership of voice and data communication facilities by large utilities.

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- More federal and state government reporting requirements.

- Mainframe- and mini-based software will grow from $103 million in 1987 to $219 million in 1992, a 16% growth rate.

Factors slowing the growth in demand for mainframe/mini-based application software include:

- Lack of organizational plans for effective utilization of computers and application software.

- Migration of current minicomputer applications to microcomputers. However, applications migration to micros will be limited by departmental needs for shared information.

Microcomputer-based applications software will grow at 25%, fastest of all computer services delivery modes, since more detailed subapplications will initially be micro-based. 1987 revenues of $53 million will become $162 million by 1992 (see Exhibit II-4). Vehicle management, which includes vehicle maintenance and operation scheduling, could initially be implemented on a micro rather than an integrated module as part of the utility administrative mainframe or minicomputer. The power of the new 80386 chip, as an example, will accelerate this trend.

Large utilities are striving to install one microcomputer for every two professional employees. The growth in installed systems and the offering of site licensing by leading vendors will spur sales of micro-based software.

J

Professional Services

The largest utilities have implemented a number of specialized applications. In this case, the challenge is linking the processors and applications through system integration. Professional services for utilities will grow at a 15% rate during the forecast period, from $357 million to $718 million. This segment represents the largest opportunity for vendors.

Systems integration in the utility segment will be a major opportunity for vendors because:

- Many utility districts (3,500) can effectively utilize system integration services.

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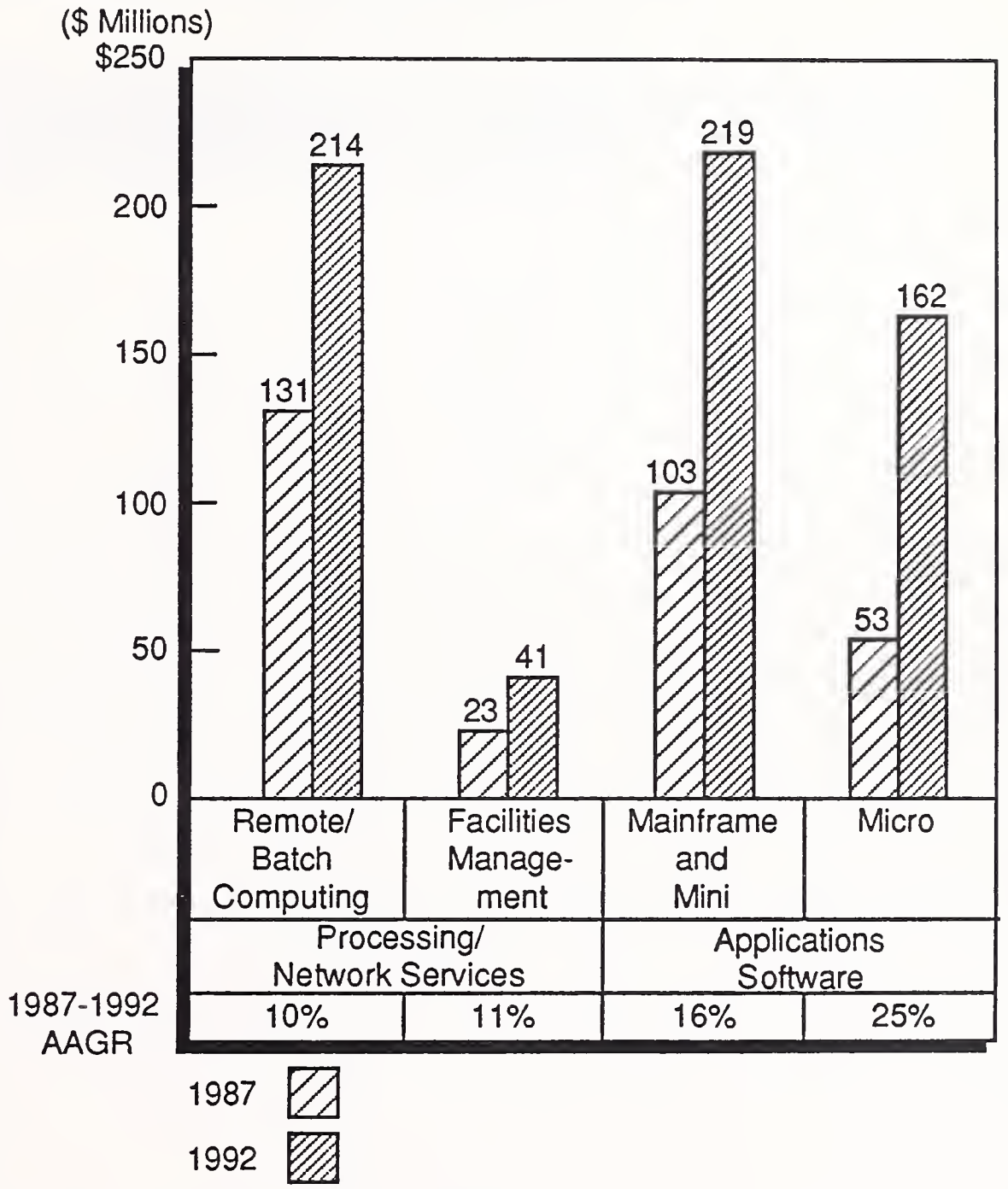
EXHIBIT II-4

UTILITIES SECTOR FORECAST
INDUSTRY-SPECIFIC INFORMATION SERVICES
BY DELIVERY MODE, 1987-1992



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- Integration of existing systems is more cost-effective than retraining users on new hardware and software.

- Large system integration projects will start with mainframe data bases used in administrative and accounting applications, and then will spread to technical applications.

- Mainframe-based system integration projects imply a captive market for IBM services since the IBM account representative is in close contact with IS management in large utilities.

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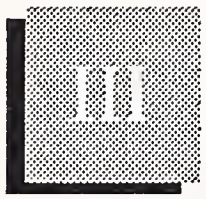
III

Competitive Developments



Competitive Developments

A Introduction

The utility information systems market is characterized by:

- Large vendors selling mainframe-based administrative software.
- A few large and numerous small vendors selling minicomputers and microcomputer software to manage operations.
- Fewer than six large processing/network vendors providing specialized information services to utilities.
- Lack of a single dominant vendor.

The market shares of leading vendors in the utility sector are shown in Exhibit III-1.

- Revenues for the top ten vendors represent 24% of total sector information services revenues. If professional services are excluded, the top ten vendors account for 37% of software and services.

Information services for the utilities sector can also be divided into administrative and operations computing.

The leaders in the administration systems market segment are:

- Babcock & Wilcox's Power Computing Company.
- Utility and Municipal Services.
- Philadelphia Suburban Corporation.

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III

Competitive Developments

A Introduction

The utility information systems market is characterized by:

- Large vendors selling mainframe-based administrative software.
- A few large and numerous small vendors selling minicomputers and microcomputer software to manage operations.
- Fewer than six large processing/network vendors providing specialized information services to utilities.
- Lack of a single dominant vendor.

The market shares of leading vendors in the utility sector are shown in Exhibit III-1.

- Revenues for the top ten vendors represent 24% of total sector information services revenues. If professional services are excluded, the top ten vendors account for 37% of software and services.

Information services for the utilities sector can also be divided into administrative and operations computing.

The leaders in the administration systems market segment are:

- Babcock & Wilcox's Power Computing Company.
- Utility and Municipal Services.
- Philadelphia Suburban Corporation.

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EXHIBIT III-1

LEADING VENDORS IN THE UTILITY SECTOR
1987

VENDOR	Processing/ Network Services	Software	Turnkey Systems	Professional Services	Total ($ Millions)	Percent of Market
Energy Incorporated	-	10	5	15	30	4.3
Babcock & Wilcox	20	-	-	5	25	3.6
GEISCO	14	4	-	2	20	2.9
Utility & Municipal Services	14	-	-	-	14	2.0
Philadelphia Suburban Corporation**	1	3	8	-	12	1.7
Quadrex Corporation	-	-	9	3	12	1.7
Equifax	10	2	-	-	12	1.7
CAP Gemini DASD	-	-	-	10	10	1.4
Flow General	-	5	-	5	10	1.4
Network Computing Corporation	9	-	-	-	9	1.3
TERA	-	12	-	3	15	2.1
Subtotal	68 (44%)	36 (30%)	22 (71%)	43 (12%)	169 (24%)	-
All Other Vendors	86	120	9	314	529	
Total	154	156	31	357	698	

*Formerly: UCCEL
**Combines: Stoner Associates and Digital Systems, Inc.

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The leaders in the operations market segment are:

- Energy Incorporated.
- Quadrex Computer Systems, Inc.
- GEISCO.
- Equifax.

B

Acquisitions

No significant mergers took place among information services suppliers to the utility market segment in 1987, which is likely a statement that:

- This is a relatively mature market dominated by a limited number of large, and profitable companies.

- Second-tier companies have not introduced significant new products or applications that would make them attractive takeover targets.

- Information services vendors' internally generated cash has been sufficient to fund research and development, product marketing, and customer support activities.

In the utility market segment for 1985-1986, INPUT identified two significant acquisitions:

- In December 1985, Babcock & Wilcox Corporation (a subsidiary of McDermott Co.), which manufactures process control equipment for utilities, purchased the Dallas (TX) processing/network service of UCCEL Corporation for $4.8 million. This operation was combined with other B & W computer services and renamed the Power Computing Company.

In 1985 and 1986, Philadelphia Suburban Corporation, the parent company of Philadelphia Suburban Water Company, acquired Stoner Associates (Carlisle, PA) and Digital Systems, Inc. (Columbia, SC). Philadelphia Suburban Corporation intends to become a major player in the utilities-based information services business.

C

Companies Exiting the Utility Market

No major vendors stopped supporting the utility market in 1986 or 1987. However, several companies that formerly received 100% of their revenues from the utility industry are broadening their focus to include other vertical applications.

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- Digital Systems, Inc. (subsidiary of Philadelphia Suburban Corporation) is targeting local and county governments in addition to the utility industry.

- Quadrex Computer Systems (Campbell, CA) is also selling turnkey systems to process industries, such as petrochemical and biological research.

D

Vendor Profiles

1. Energy Incorporated (One Energy Drive, P.O. Box 736, Idaho Falls, ID 83402, (208) 529-1000

a. Products/Services

Energy Incorporated (EI) sells software, services, and computer systems for power generation applications for the electrical power industry.

The company's 26 applications software products serve three key areas:

- Engineering (utilizes IBM PCs).

- Plant management (utilizes IBM mainframes, DEC VAX, Prime).

- Real-time monitoring and control (utilizes DEC VAX and MicroVAX, Gould, Modcomp, and CDC Cyber systems).

Professional services include consulting on quality assurance, nuclear operations, facilities management, education, and training.

b. Markets Served

Before 1985, EI served two markets – electric power utilities and companies disposing of hazardous toxic waste materials. In 1985, EI spun off the firm serving the hazardous waste material business.

EI is now 100% focused on the electric power utility industry.

c. Company Strategy

EI provides a full range of software and services to the electric power industry, designed to help manage existing and new power generation plants.

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d. Recent Activities

In 1985, EI spun off Waste-Tech Services, Inc., its subsidiary for the safe destruction of hazardous and toxic wastes.

e. Future Direction

Energy Incorporated will emphasize its proprietary software products, consulting and risk assessment services, and real-time process monitoring and control systems.

EI will offer its monitoring and control systems on more vendors' hardware platforms.

2. Equifax, Inc. (1600 Peachtree Street, N.W., Atlanta, GA 30309, (404) 885-8000)

a. Products/Services

Equifax offers a range of applications software products to the utilities industry through its Enercom division.

Applications software packages include:

- Advanced Commercial Evaluation System (ACES) – commercial building energy audits.
- Residential energy audit system, via PCs.
- Graphics software to show energy usage (ENER GRAF).
- PC-based energy conservation educational programs.
- Utility customer information.
- Scheduling and job tracking weatherization programs for utility customers.
- Irrigation pumping programs.
- "Exchange" program to match "skip accounts" with new connections across geographic boundaries.

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b. Markets Served

Equifax targets all utility companies, emphasizing electrical utilities.

Sales of utility industry software represent less than 5% of corporate revenues.

c. Company Strategy

Since nearly 95% of company revenues are derived from processing services, Equifax will continue to emphasize those services, targeting the insurance industry, which accounts for nearly one-half of corporate revenues.

In the utility area, Equifax will add more applications for portable micro-computers and hand-held calculators.

Equifax will offer some of its applications on mainframe computers through GEISCO processing/network services.

d. Recent Activities

C.B. Rogers, former senior vice president of IBM, became Equifax president and C.O.O. on October 1, 1987.

e. Future Direction

Since all other company business segments are relatively large, INPUT expects Equifax to either enlarge the utility software business through acquisition or spin it off.

3. Power Computing Company (a business unit of Babcock & Wilcox, a McDermott Company) (1930 Hi Line Drive, Dallas, TX 75207, (214) 655-8694)

a. Products/Services

Network/processing services to electric utility companies. Products include a quality assurance program and tools for regulatory, analytical, and record keeping requirements. Engineering and scientific applications software are available for a wide variety of uses.

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Professional services are offered to provide solutions to unique, technically complex scientific, engineering, and data management problems.

PCC utilizes CDC Cyber, IBM 3083, and Prime 750 systems to support its customers, using a proprietary communications network, or Tymnet/Telenet.

b. Markets Served

Electric power and energy industries.

c. Company Strategy

PCC was created in 1986 as a result of Babcock & Wilcox purchasing the Computing Services Division of UCCEL. PCC combined the UCCEL acquisition with existing B & W computer services facilities.

PCC's mission is to provide services to utility companies, using B & W's knowledge of this industry as a springboard.

Professional services have been added to computer processing power and the software library to broaden PCC's offerings to its target vertical market.

4. General Electric Information Services Company (GEISCO) (401 North Washington Street, Rockville, MD 20850, (301) 340-4000)

a. Products/Services

GEISCO provides interactive, remote batch, applications software, and inquiry/response processing services to the utilities market sector.

b. Markets Served

Electric utilities.

c. Company Strategy

GEISCO provides a full range of integrated applications software for utility billing and other commercial activities.

GEISCO-developed software can be accessed through the company's MARK III and MARK 3000 processing/network services.

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b. Markets Served

CAP Gemini provides services to electric, gas, water, and sewage utilities.

c. Company Strategy

CAP Gemini leverages its strengths in project management and internally developed software to help sell to Fortune 1000 companies and large utilities.

d. Recent Activities

The company helped many large customers implement fourth-generation language applications and information centers.

e. Future Direction

Cap Gemini plans to integrate new technologies such as CD ROM disks in service offerings.

It also intends to maintain its existing base of contract programmers, a difficult task in light of recruiting efforts by other firms, including CAP Gemini's customers.

8. TENERA (formerly TERA) Corporation (1995 University Avenue, Berkeley, CA 94704, (415) 845-5200)

a. Products/Services

TENERA provides computer-aided services and software products to the elective utility and manufacturing industries.

The company has developed and marketed its Plant Information Management System (PIMS), an on-line system that coordinates and controls plant maintenance for the utility industry.

PIMS operates on IBM 43XX and 30XX mainframes with MVS or DOS operating systems.

b. Markets Served

Electric utilities and manufacturing firms.

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Sales to utilities represent 85% of total revenue.

c. Company Strategy

TENERA provides computer-aided services and software products to the utility and manufacturing industries. Four separate divisions focus on utilities: systems and software, environmental services, engineering services, and, in 1987, a new management consulting division.

d. Recent Activities

TENERA has announced a teaming agreement with Bechtel to cooperatively market selected products and services.

A key 1987 objective for TENERA was to reduce the concentration of revenue from its largest client. From 65% in 1986, these revenues increased to for 51% of the total in mid-1987.

TENERA added a new operating division in 1987 to focus on management consulting for electric utilities in the areas of case management, litigation, regulatory support, and organizational effectiveness.

e. Future Directions

TENERA will increase the value of its services through the acquisition of computer-related products and services.

9. Digital Systems, Inc. (a division of Philadelphia Suburban) (P.O. Box 12, Columbia, SC 29202, (803) 799-4094)

a. Products/Services

Digital Systems markets and supports turnkey systems for the utility industry and local/county governments.

Specific products include:

- Integrated utility management, utilizing DEC VAX or PDP-11 hardware.
- Fund and encumbrance package, based on DEC VAX or PDP-11 hardware.

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b. Markets Served

Digital Systems sells to utilities and local/county governments.

Sales to utilities represent about 75% of total revenues.

c. Company Strategy

Digital Systems provides a full range of products and services to the electricity/gas/water/waste utilities market.

d. Recent Activities

Since market requirements for its products are so different, the company recently formed two divisions to sell its products.

e. Future Direction

Digital Systems will emphasize sales of its fund and encumbrance package to local and county governments as a second product line.

10. Tres Computer Systems, Inc. (Division of Control Data Corporation) (14801 Quorum Drive, Dallas, TX 75240, (214) 385-5800)

a. Products/Services

Tres Systems provides applications software and professional services primarily for utilities and municipalities.

Tres' Customer Billing and Information System and its Materials Management System utilize IBM mainframe computers.

Professional services include system design, software customization, and consulting.

b. Markets Served

Tres Systems markets to investor-owned utilities, municipal-owned utilities, and local transportation agencies.

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c. Company Strategy

Tres' strategy concentrates on providing a full range of services and applications software for large utilities and transportation agencies.

To lock in customers, the company's software is full featured and contains more than 1.1 million lines of code, an accomplishment that would be hard to duplicate in a timely manner.

d. Recent Activities

The company began emphasizing sales to transportation authorities of its Material Management package, which provides about 20% of revenues.

11. Other Vendor Activity

A number of new meter-reading products are appearing, which automate this previously labor-intensive activity using radio signals, cable TV lines, power lines, or telephone lines. Enscan, Base Ten, and Data Beam are three such firms.

Software products to evaluate water quality are available from Henco and Environmental Systems Research Institute.

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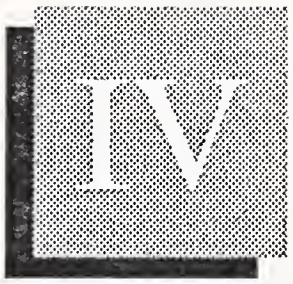
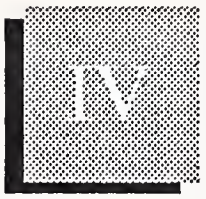


Information Systems Planning



Information Systems Planning

A Major Issues

1. Driving Forces

Merger and acquisition activities among utilities are increasing and will result in larger, but fewer, utilities, especially electric.

- Pacific Lighting Corporation (Los Angeles, CA) acquired drugstore chain Thrifty Corporation (Los Angeles, CA) in an effort to diversify its operations.

- Pacific Gas & Electric Company (San Francisco, CA) has made an offer to merge with the Sacramento (CA) Municipal Utilities District.

The cost of building new nuclear power plants continues to force budget austerity. Although building nuclear power plants may be necessary to provide sufficient capacity, building costs for such plants have escalated in the last few years to where a new plant costs $4 - $6 billion.

State utility commissions are separating power generation from power distribution activities. Rate changes are divided into the cost of power production and the cost of power transmission.

The federal government is gradually deregulating prices for electricity and natural gas, adding pressure on utilities to learn how to effectively market their products. Further pressure comes from certain state governments, which are permitting utilities in their state to sell electricity or gas to customers in neighboring states.

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Cogeneration is now a reality in the power business. Large industrial customers can purchase generators capable of providing internal capacity and excess power. The excess power must, by law, be purchased back by the local electric utility at comparatively high rates.

As a result of deregulation and cogeneration, utilities face more competition. New systems to address market-based requirements must be established. To prosper, utilities must learn marketing. Marketing efforts will be directed mainly at the largest customers, which must be retained spread the fixed costs across a wider user base. Exhibit IV-1 illustrates the above issues.

EXHIBIT IV-1

UTILITY SECTOR—DRIVING FORCES

- Mergers and Acquisition Will Lead to Fewer Utilities
- Flattening Demand for Electricity
- Building of Nuclear Power Plants Forces Budget Austerity
- Separate Power Generation and Distribution Activities
- Federal Government Deregulation
- Power Cogeneration
- More Emphasis on Marketing
- Continued Conversion to On-Line by Rural Utilities

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As part of an improved service orientation, smaller, rural utilities are continuing the conversion from batch to on-line systems. Department managers strongly influence the operations of smaller utilities. In the past, near-monopoly rural utilities spent as little as possible on technology. Now they must invest in new systems to meet a changing economic and regulatory environment.

2. Issues and Objectives

Cost containment has always been a major issue in this industry. Service requirements must be balanced against funds available for increases through rate hikes and the need to pay shareholders of investor-owned utilities a fair return on their investments.

More regulatory changes mean more changes to the existing software to accommodate the wishes of state legislatures or other governmental bodies. Minor changes are not a problem; however, major regulatory changes mean major software rewrites, testing, and debugging.

Interestingly, a few large utilities have installed and tested Local-Area Networks (LANs). Now that users have seen what they can do, virtually every user wants to be part of the network, whether or not the network is relevant to that person's job.

Utilities are coping with the problem of how to structure the organization's data processing operation. Should it be centralized, distributed, or a "hybrid" in order to best accomplish necessary tasks? Decentralization is being discussed as a means to delay the purchase of an additional mainframe, since the existing mainframe is already burdened by the growth of applications/power needs.

Office automation, especially in IBM environments, is being implemented slowly, with calendar functions and electronic mail as the primary applications.

Utilities are buying used computers to help stretch their budgets. While the purchase of used disk and tape drives is relatively commonplace, buying used CPUs is a major, but necessary, step for many utilities.

IS managers appear to have a broader organization perspective than many utility company senior managers. They want to use IS to improve customer service through on-line inquiry, on-line posting, and relational

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DBMS-based customer information systems, thus providing vital marketing information.

Senior management must begin to use information for a strategic or competitive advantage. While one electric company does not compete with another, many factors influence a developer's choice of gas or electric heat for a new shopping center or office building.

In a couple instances, IS managers wanted to use IS to foster better organizational teamwork and cooperation. The utility industry may be the last business where department managers run the company, rather than senior management providing organizational leadership and direction.

Exhibits IV-2 and IV-3 expand on these points.

EXHIBIT IV-2

UTILITIES SECTOR—ISSUES

- Cost Containment
- More Regulatory Changes
- Control Growth of LANs
- Centralized/Distributed/Hybrid Processing
- Office Automation
- More Used Computers

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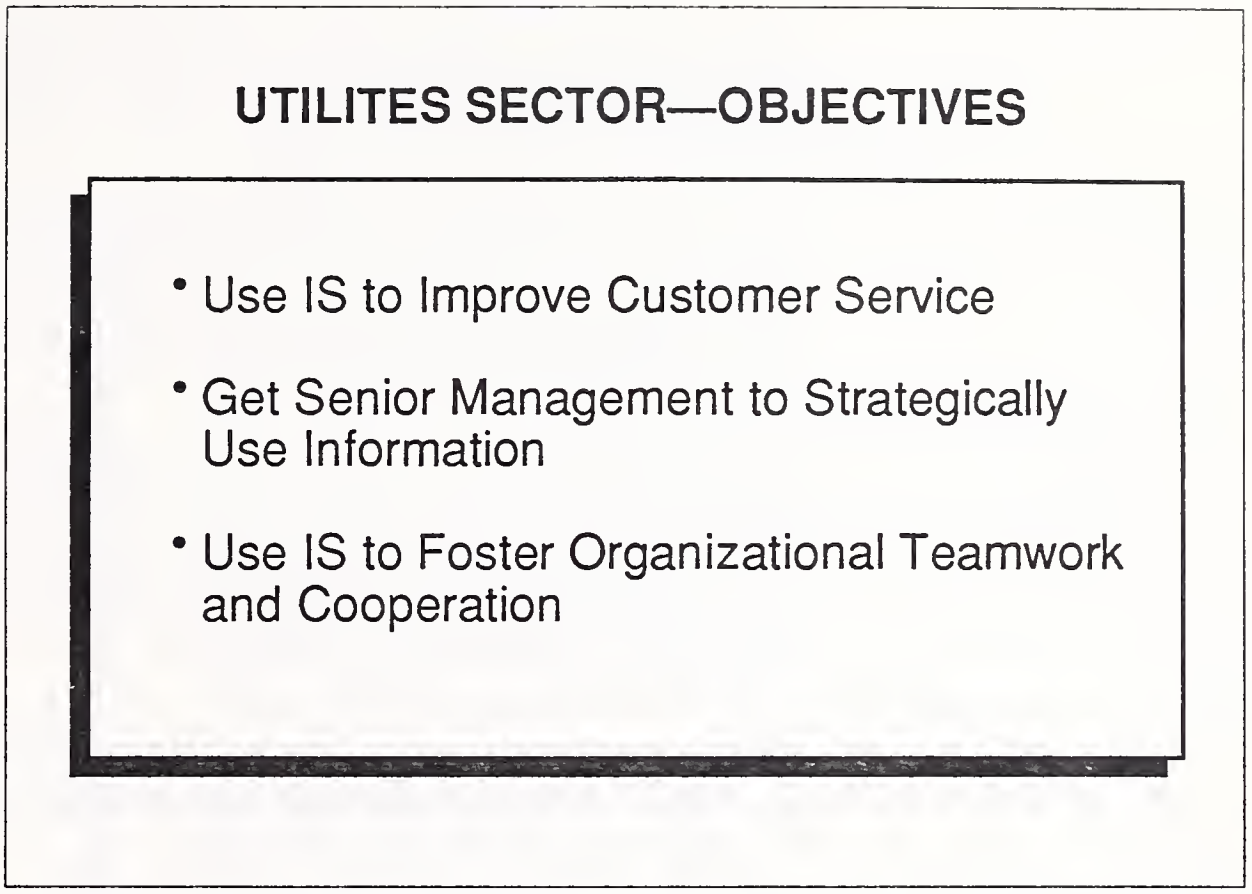
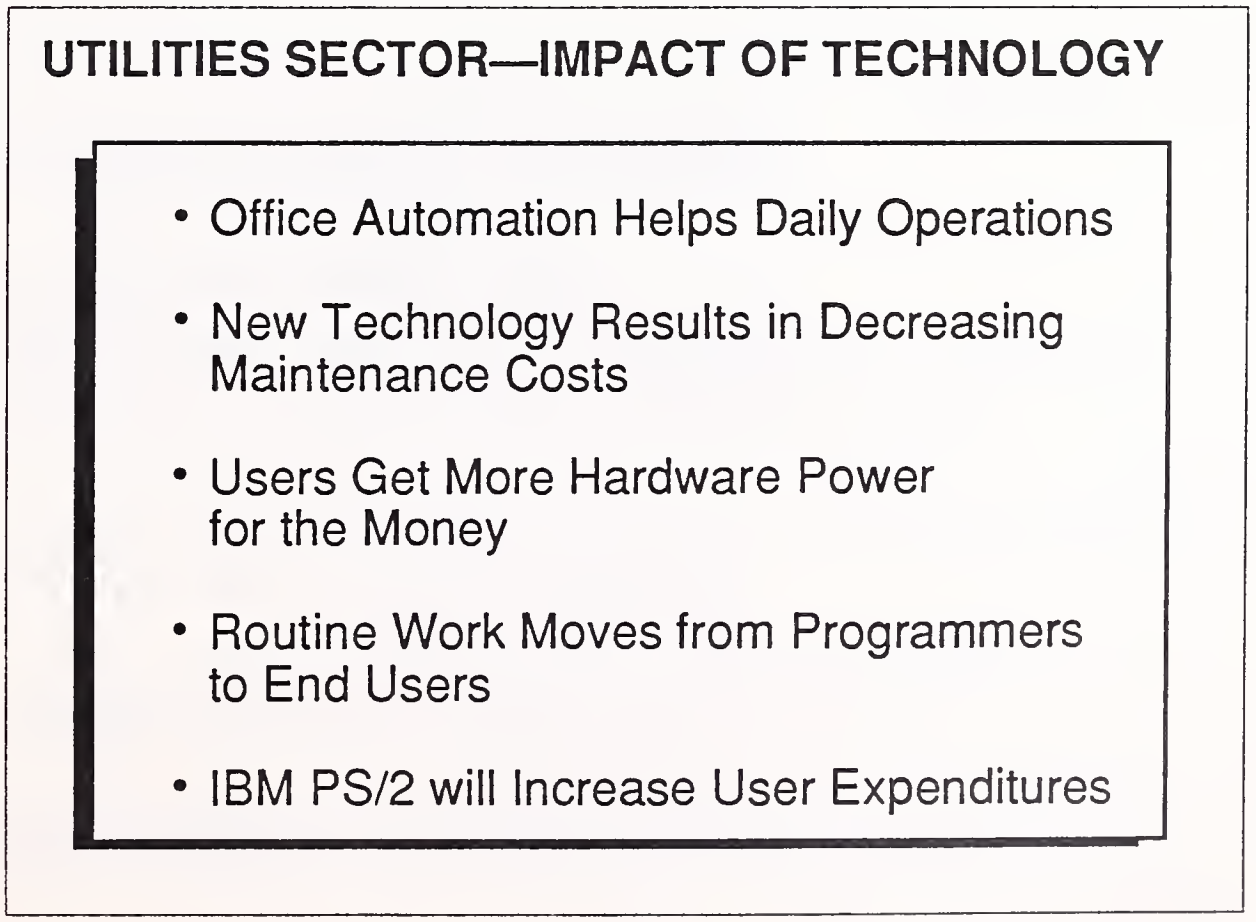
EXHIBIT IV-3


UTILITES SECTOR—OBJECTIVES
• Use IS to Improve Customer Service
• Get Senior Management to Strategically Use Information
• Use IS to Foster Organizational Teamwork and Cooperation

3. Impact of Technology

Exhibit IV-4 highlights five key aspects of what technology has done for end users in the utility industry.

EXHIBIT IV-4


UTILITIES SECTOR—IMPACT OF TECHNOLOGY
• Office Automation Helps Daily Operations
• New Technology Results in Decreasing Maintenance Costs
• Users Get More Hardware Power for the Money
• Routine Work Moves from Programmers to End Users
• IBM PS/2 will Increase User Expenditures

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First, office automation helps manage the daily operations in electric, gas, and water/waste utilities. Better communications are a must for improving customer service and becoming more competitive.

Second, new hardware technology has resulted in steadily decreasing maintenance costs over the past two years. While manpower requirements to operate an IBM mainframe have not changed much, IBM decreased its direct charges for maintenance under its CSA program.

Third, for the same amount of money spent three years ago, a user now gets ten times the raw hardware power. However, increases in the number of applications supported and the increasing memory required to support each application results in a minimal overall gain. More robust software continues to help sell more hardware.

Fourth-generation application development software helps move more routine work from programmers to end users, enabling programmers to catch up on the applications backlog.

Finally, IBM's new PS/2 system will have the effect of forcing end users to spend more money to adapt and integrate this new technology into existing IBM PC/XT/AT-based operations. This need for an increased budget comes at a difficult time for utilities, when management would rather watch all IS spending.

B

New Applications

Application development within the utilities sector continues its focus on asset management and customer-oriented systems. Exhibit IV-5 highlights the specific applications to be started or continued in 1988.

Better utilization of people's time and the capital assets in place represents a major means of improving overall financial performance. The installation of customer-oriented systems may be the result of:

- A different regulatory environment.
- The financial community's perception of what makes for a "better" investor-owned utility.
- Utilities' responses to increased competition.

Shareholder systems are also being updated to foster better relations with

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EXHIBIT IV-5

**UTILITIES SECTOR—
NEW APPLICATIONS IN 1988**

- Shareholder Systems
- Repetitive Maintenance for Nuclear Facility
- Distributed Work Information Power Plant Maintenance System
- On-line Financials (AP/AR/GL/Billing)
- Conversion from Batch to On-Line Systems

shareholders, in the increasingly likely event of a takeover offer. Better relations should result in increased loyalty to the organization and, indirectly, to current management.

People and asset management applications include:

- Repetitive maintenance for nuclear facilities.
- Distributed work information systems.
- Power plant maintenance system.

Medium-sized gas, electric, and water/waste utilities are continuing to convert financial systems from batch to on-line operations.

The utility sector has few IS needs that respondents believe are not well-served by vendors. Specifically, users want:

- More networking options available through each vendor.
- More involvement by vendors to help hold costs down.

Without prompting by INPUT interviewers, users remarked favorably about the decreasing mainframe hardware maintenance costs under

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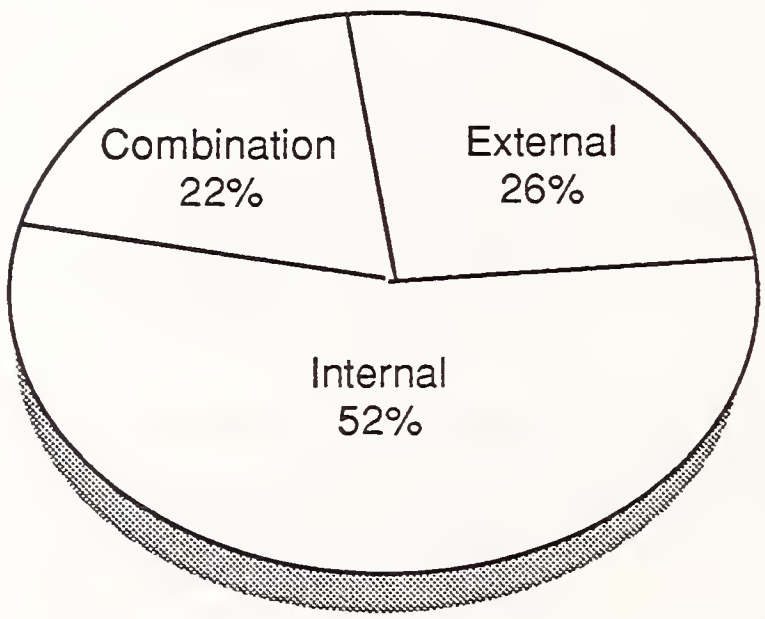
IBM's new Corporate Service Amendment (CSA). However, the CSA is designed generally for large accounts that must meet such requirements as setting up a first-line of contact for internal users (to minimize "no fault found" service calls), agreeing to a long-term contract with heavy cancellation penalties, and having staff members trained at certain IBM-determined levels of competency for the user's computer system.

However, users believe that, in general, vendors are trying to sell too much technology too fast.

According to the information depicted graphically in Exhibit IV-6, the utilities sector is divided in its approach to software development.

EXHIBIT IV-6

UTILITIES SECTOR—SOURCE OF APPLICATION DEVELOPMENT
(For Major New Applications)



- Larger utilities tend to develop new applications in-house, while smaller organizations generally rely on third-party software vendors for new applications.

- Maintenance and enhancement of existing applications takes far greater resources than developing new applications. Larger utilities devote approximately 50% of software development staff to developing new applications. Smaller utilities devote less than 30% of their software development staff to developing new applications.

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One respondent expressed a caveat for third-party software vendors. Specifically, although utilities must accomplish the same basic tasks, no two utilities approach the problem in the same way. Therefore, some level of software customization is necessary to help make the sale. Customization requirements can be minimized by offering menu-driven choices within the application software package, thereby simplifying user support requirements.

The cost range of new applications, whether developed in-house or purchased from a third party are:

- Mainframe Based: $90,000 - $2,000,000
- Minicomputer Based: $18,500 - $950,000
- Microcomputer Based: $165 - $9,300

The average costs of purchased application software are:

- Mainframe Based: $550,000
- Minicomputer Based: $67,500
- Microcomputer Based: $1,175

C

Budget Analysis

In 1987, respondents experienced limited growth in their IS budgets, due primarily to increased in salaries and fringe benefits and the negative effects of nuclear power plant construction cost overruns.

- Overall IS spending in 1988 is projected to decrease 0.2%.

- Exhibit IV-7 shows the 1987 budget distribution and projects the growth in specific budget categories in 1988.

In general, IS budgets at large utilities are growing faster than those at medium and smaller utilities. The unique staffing and equipment requirements at nuclear power plants account for the difference. If nuclear plants are deleted from the analysis, then budgets at medium and small utilities are increasing 0.7% faster than those of large, investor-owned utilities.

A comparison of data from 1985, 1986, and 1987 indicates that 1987 was an unusual year. Generally speaking, more utilities took one of the following actions than in either of the two previous years:

- Purchased new equipment.
- Leased more equipment.

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EXHIBIT IV-7

UTILITIES SECTOR—1987 BUDGET DISTRIBUTION AND 1987-1988 CHANGES

BUDGET CATEGORY	1987 I.S.BUDGET (Percent)	1987-1988 EXPECTED BUDGET GROWTH
PERSONNEL (Salaries & Fringe Benefits)	36.3	2.5
HARDWARE		
Mainframes	12.2	(9.7)
Minicomputers	6.6	(4.2)
Microcomputers	4.3	2.5
Mass Storage Devices	2.9	3.0
Other Hardware	2.2	(2.4)
TOTAL HARDWARE	28.2	(2.2)
Data & Voice Communicatons	4.8	4.9
External Software	6.5	8.3
Professional Services	4.5	(6.6)
Turnkey Systems	2.1	0.2
Software Maintenance	3.4	3.5
Hardware Maintenance	9.3	(11.2)
Outside Processing Services	0.1	2.3
Supplies	3.5	2.1
Travel, Subscriptions, Etc.	1.3	(6.8)
Subtotal - Maintenance, Services & Other	35.5	(1.3)
TOTAL	100.0	(0.2)

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- Upgraded existing equipment.
- Bought used equipment.

As shown in Exhibit IV-8, nearly 60% of the respondents project that their IS budgets will decrease or remain the same in 1988 as in 1987.

Indirect factors contributing to decreases in the IS budget include:

- The effects of nuclear power plant construction.
- Managing reported "earnings per share."

Factors directly contributing to increases in the IS budget include:

- Personnel expenses.
- New application software development projects.

Four factors were listed as the major contributors to decreases in the IS budget, namely:

- Declining state/local economies (resulting in a smaller customer base for services).

- Significant reduction in the purchases of software development (professional services).

- Declining hardware maintenance for IBM mainframes, resulting from adoption of IBM's Corporate Service Amendment (CSA).

- Less travel to conferences and seminars, especially from rural locations.

Headcounts within utilities sector IS departments decreased somewhat from 1986 to 1987. Larger utilities tended to add personnel, while head counts in smaller utilities decreased. These decreases can be attributed to increased efficiency resulting from automation, or to not replacing employees who quit or retire.

- 17% reported the head count increased.
- 56% reported the head count remained the same.
- 27% reported the head count decreased.

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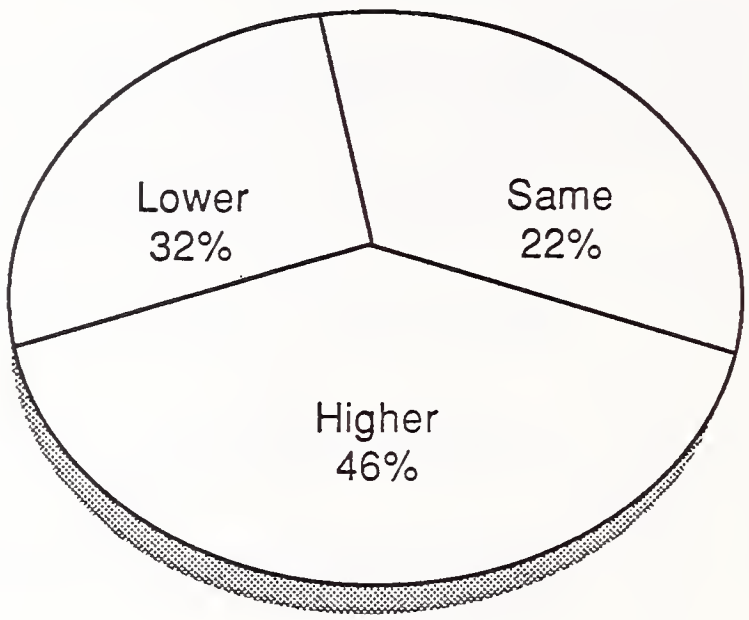
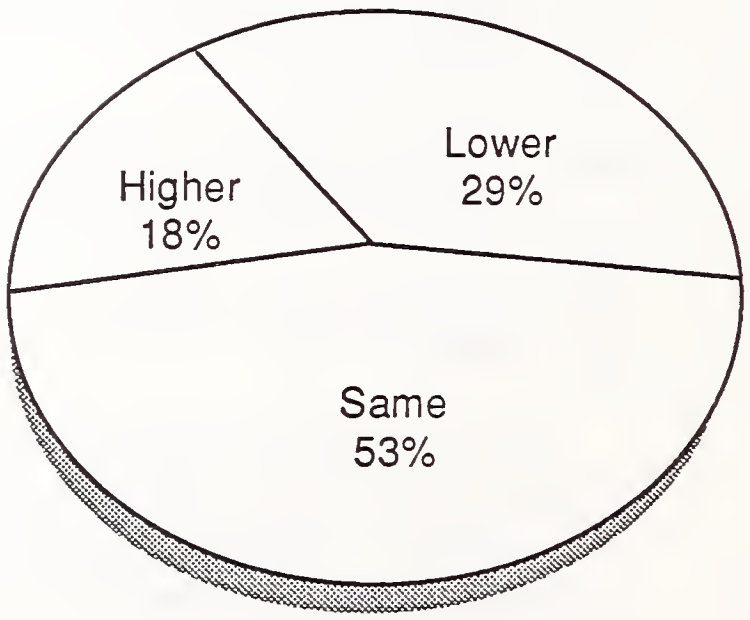
EXHIBIT IV-8

UTILITIES SECTOR—MOST BUDGETS WILL REMAIN FLAT OR WILL DECREASE



Comparison of
1988 and 1987
I.S. Budget



Comparison of
Changes in Growth Rates of
1987 and 1988 I.S. Budgets
(Among Sites with Increasing Budgets)

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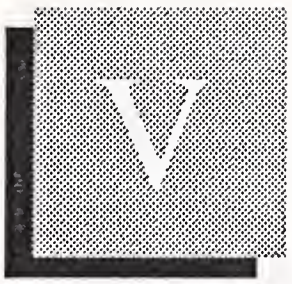
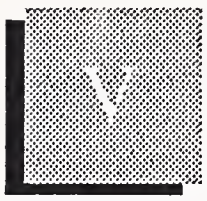


New Opportunities



New Opportunities

A

Administrative Market Sector

Cost-effective applications software development is very important to users.

- Vendors should offer the means to develop mainframe applications on personal computers that can be tested and debugged locally, then uploaded to the corporate mainframe.

- At $600 per hour for timesharing on a mainframe, the use of micros for program development has a tremendous payback.

Software and professional services in support of local-area networks (LANs) represents a growing area. Software must retain its functionality on the network. Professional services such as consulting with the LAN vendor may be necessary to sell more software and ensure that the software actually works.

There is continued interest in the "next generation" customer information system, which features on-line data bases with information that can be updated by designated operators.

While large utilities continue to use IBM mainframes for administrative and accounting applications, medium and small utilities have a large installed base of superminicomputers manufactured and serviced by (in descending order of installed base):

- Digital Equipment Corporation (DEC).
- Hewlett-Packard (HP).
- Prime Computer.
- Data General Corporation (DG).

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Providing integrated software for accounting and administrative applications running on these superminis represents an opportunity for software vendors.

Discussions with data processing managers at large utility companies revealed a trend toward combined telecommunications and other information services. Vendors can help these managers devise the means to effectively combine telecommunications and IS technologies.

Fiber optic communications increase telecommunications capabilities in two ways:

- The number of simultaneous voice and/or data transmissions.
- The ability to transmit more graphics-based information.

Advanced communications systems for automated meter reading are of high interest.

Developing high-quality industry-oriented software is always a vendor opportunity. Vendors who start with a clean sheet of paper and talk to many utilities to learn their software requirements have an advantage over vendors taking generic software and modifying it to fit the regulated utility industry. State and federal government reporting requirements for utilities are very specific; "generic" software cannot fully address these user needs.

Partnerships between hardware vendors and other suppliers represent a "ground floor" opportunity. Examples include:

- Turnkey systems for setting up, reading, and verifying data from hand-held meters.
- Microcomputer-based systems using bar code readers for inventory management, paperwork management, and asset control.
- Desktop publishing systems for newsletters and forms development and modification.
- Automation of purchase requisitions and followup.
- Automation of work orders and followup.

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B

Operations and Maintenance Market Segment

Wide year-to-year variations in data processing budgets will accelerate the need for improved asset management. Utilities' major assets include buildings, vehicles, and the computer system.

The most popular minicomputers in small and medium utilities are (in decreasing order of installed base):

- DEC MicroVAX.
- Hewlett-Packard 1000.
- IBM System/36 and IBM PC.

Microcomputer-based applications software or turnkey systems for asset management are needed.

Low-cost microcomputers enable suppliers to sell redundant monitoring and control systems at very low prices compared to redundant minicomputer-based systems.

Small utilities typically hire consultants to design specifications for systems used in operational applications. The consultant really determines the level of hardware and software integration. Savvy vendors will keep in close contact with consultants and help plan the system to be installed or the modifications necessary.

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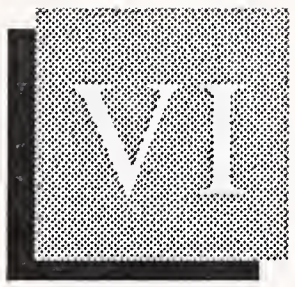
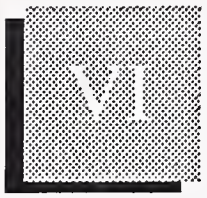


Conclusions and Recommendations



Conclusions and Recommendations

Trends toward deregulation and increased availability of other fuel sources are forcing utilities to become even more efficient.

The most promising products and services will improve asset management, monitoring, and control systems, and will provide turnkey solutions for such applications as desktop publishing, meter reading, and many business problems that can be effectively solved using bar-code-based peripherals.

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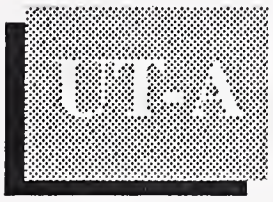
UT-A

Appendix: User Expenditure Forecast, 1986-1992



Appendix: User Expenditure Forecast, 1986-1992

Exhibit UT-A-1 contains the industry specific user expenditure forecast for the utilities industry sector for 1986 to 1992.

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EXHIBIT UT-A-1

UTILITIES SECTOR
INDUSTRY-SPECIFIC USER EXPENDITURE FORECAST, 1986-1992

SEGMENTATION BY DELIVERY MODE	1986 ($M)	1986-1987 Growth (%)	1987 ($M)	1988 ($M)	1989 ($M)	1990 ($M)	1991 ($M)	1992 ($M)	AAGR 1987-1992 (%)
Processing/ Neworks Services									
Remote Computing/ Batch	119	10	131	145	161	177	194	214	10
Facility Manage-ment	21	10	23	26	29	32	36	41	12
Total Processing Services	140	10	154	171	190	209	230	255	11
Applications Software									
Mainframe/Mini	88	17	103	121	142	164	190	219	16
Micro	42	26	53	67	84	105	130	162	25
Total Application Software	130	20	156	188	226	269	320	381	20
Turnkey Systems	27	15	31	35	40	46	51	57	13
Professional Services	305	17	357	418	480	552	630	718	15
Sector Total	602	16	698	812	936	1,076	1,231	1,411	15

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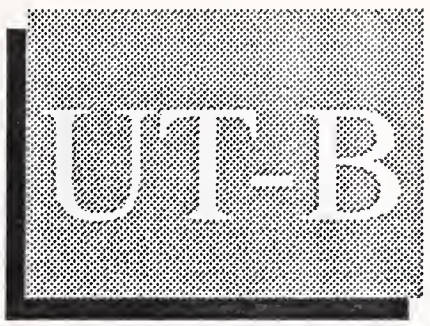

Appendix: Forecast Reconciliation

UT-B

Appendix: Forecast Reconciliation

This appendix indicates the changes made to this year's forecast as compared to last year's.

EXHIBIT UT-B-1

UTILITIES DATA BASE RECONCILIATION OF MARKET FORECAST, BY DELIVERY MODE

DELIVERY MODE	$ Millions		1986 Revenue Variance as a Percent of 1987 Report	1991 Revenues From 1986 Forecast	1991 Revenues From 1987 Forecast	1991 Revenue Variance as a Percent of 1987 Forecast	86-91 AAGR Forecast in 1986 Report (Percent)	86-91 AAGR Forecast in 1987 Report (Percent)
	1986 Revenues From 1986 Forecast	1986 Revenues From 1987 Report						
Processing Services								
Remote Computing/ Batch	117	119	-2	181	194	-7	9	10
Facility Management	21	21	0	38	36	6	13	12
Total Processing	138	140	-1	219	230	-5	10	11
Applications Software	122	130	-6	267	320	-17	17	20
Turnkey Systems	29	27	7	51	51	0	12	13

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About INPUT

INPUT provides planning information, analysis and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, communications, and office products and services.

The company carries out continuous and in-depth research. Working closely with clients on important issues, INPUT's staff members analyze and interpret the research data, then develop recommendations and innovative ideas to meet clients' needs. Clients receive reports, presentations, access to data on which analyses are based, and continuous consulting.

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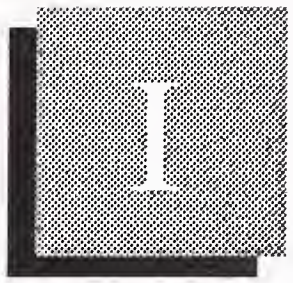

Issues, Trends, and Events

I

Issues, Trends, and Events

A

Definitions and Applications

INPUT divides the "Other Industries" market into six major segments, listed alphabetically:

- Agriculture, Forestry, Fishing
- Automotive Services
- Construction
- Hotel/Motel/Lodging
- Not-for-Profit/Membership Organizations
- Recreation/Entertainment

Exhibit I-1 lists the Other Industries the corresponding Standard Industrial Classification (SIC) Codes for each major segment. A detailed definition of each segment follows.

- Agriculture includes grain, fruit growers, produce and livestock farms, farm services (except veterinary services), forestry, commercial fishing, and hunting and trapping enterprises.

- Automotive services includes automobile rental agencies as well as all types of automobile repair services.

- Construction includes general contractors, specialists in highway and heavy construction, specialized contractors (plumbing, electrical, heating/ventilation/air conditioning, bricklaying, paperhanging, structural steel erecting, and glass and glazing work).

- Hotel/Motel/Lodging includes lodging chains, inns, resorts, trailer camps, and rooming houses. Restaurants are excluded since they are covered under the retail distribution sector.

- Not-for-profit and membership organizations include non-profit philanthropic organizations, industry associations, professional associations,

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and membership clubs. Specific examples of non-profit organizations include museums, art galleries, and botanical and biological gardens.

- Recreation and entertainment includes theaters and drive-in theaters, sports, amusement parks, sports membership clubs, rentals of sports and camping equipment, and motion pictures and television production.

EXHIBIT I-1

"OTHER INDUSTRY" SECTOR

INDUSTRY SEGMENT	TWO-DIGIT SIC CODES INCLUDED
Agriculture, Forestry, Fishing	01 through 09
Automotive Services	75
Construction	15, 16, 17
Hotel/Motel/Lodging	70
Not-for-Profit/Membership Organizations	84, 86
Recreation/Entertainment	78, 79

B

Issues

1. Agriculture

U.S. government statistics show 2.2 million farms, 3,200 commercial foresters, and 4,000 commercial fisheries.

As of December 1986, approximately 3.9 million persons were employed in agriculture (2.7 million), forestry (0.9 million), and commercial fishing (0.3 million).
In 1982, 27,800 farms were considered large (sales were greater than $500,000) compared to 11,400 large farms in 1974.

- In 1986, large-scale farms controlled more than 10% of farm land and 33% of the value of U.S. farm production.

- Thirty-seven percent of large-scale farms are corporations; however, about 95% of farm corporations are family held.

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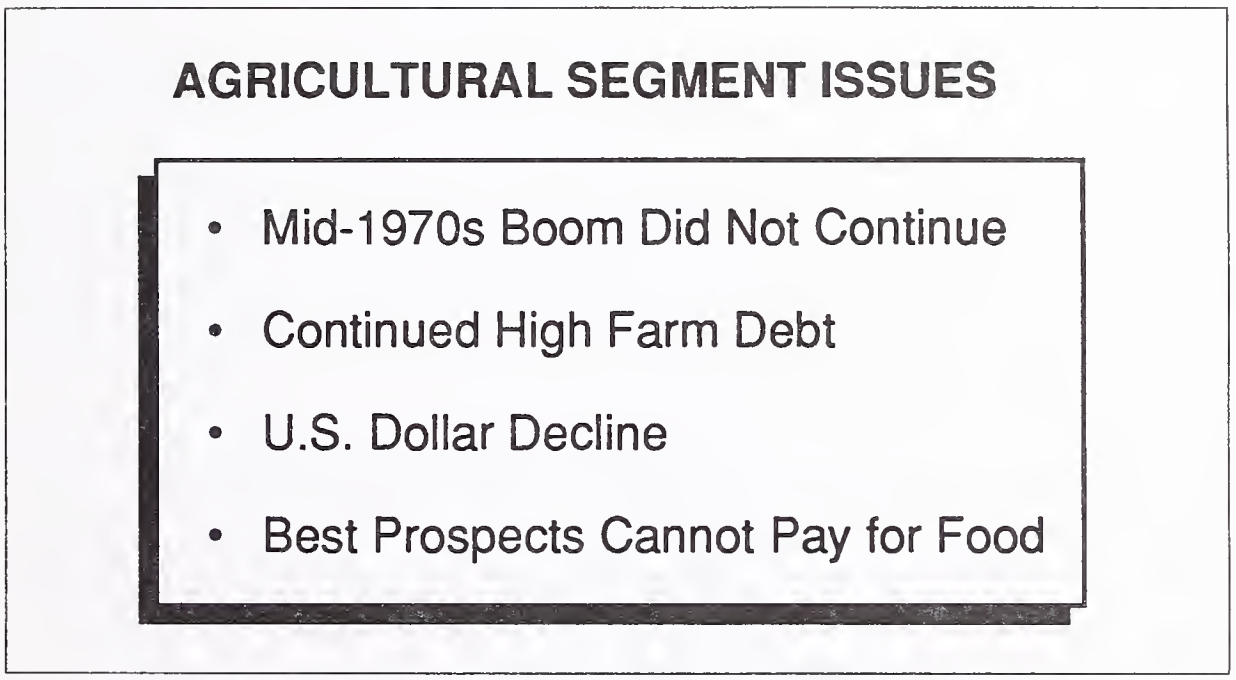
Key issues for the agricultural sector, summarized in Exhibit I-2, primarily macroeconomic ones, are generally beyond farmers' control. High grain prices, zooming prices for farm land, and the prospect of a worldwide grain shortage in the mid-1970s led to the entry of more than 1 million new farmers. Unfortunately, the situation changed drastically, and 650,000 U.S. farmers have since "called it quits." Since the late 1970s, prices for farm commodities have fallen dramatically. Surviving farmers have become financially conservative. Those farmers showing a profit have used some of their profits to reduce the high level of debt for farmland and machinery. Others continue to eke out an existence. The decline in the U.S. dollar against foreign currencies has made it more difficult to sell surplus agricultural and livestock commodities overseas.

EXHIBIT I-2


AGRICULTURAL SEGMENT ISSUES
• Mid-1970s Boom Did Not Continue
• Continued High Farm Debt
• U.S. Dollar Decline
• Best Prospects Cannot Pay for Food

- Furthermore, the currencies of America's major agricultural competitors–Canada, Australia, and Argentina–have fallen more than the dollar, making their products relatively cheaper abroad than U.S. agricultural products.

- The best customers for surplus grain, the third world nations, are heavily debt-ridden and cannot pay for agricultural commodities.

2. Automotive Services

Automotive services includes automobile dealers and independent repair, parking, and automobile rental. In 1986, automobile services employed 975,000 persons, and Americans spent $28.5 billion for automobile repairs, $14.3 billion for automobile and truck rentals, and $2.6 billion for automobile parking.

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Automobile dealers see increasing importance of automobile maintenance services as key components of customer satisfaction.

- Auto service vendors are looking for ways to keep their existing customers and inexpensively prospect for new customers.

Under-the-hood technology is increasing faster than the ability of service technicians to keep up with it. Manufacturers have developed the following products:

- Ford Motor Company and Hewlett-Packard Company are developing a computer-controlled diagnostic system, called the Service Bay Diagnostic System (SBDS), which will link a vehicle's on-board computer with sophisticated diagnostic equipment.

- Chrysler Motors is developing hand-held service computers to read information from the automobile's on-board computer.

- General Motors, through its Buick Division's Computerized Automotive Maintenance System (CAMS), has developed personal computer-based diagnostic equipment, installed at 1,200 dealers as of December 1986. Plans call for the CAMS System to be used throughout General Motors.

As a result of increased competition and more monitoring by insurance companies, owners of auto body shops must become more efficient at estimating. Furthermore, new entrants and increased price competition among automobile rental agencies have sparked the drive for more rapid and convenient auto reservation systems. These issues are summarized in Exhibit I-3.

EXHIBIT I-3

AUTOMOTIVE SERVICES SEGMENT ISSUES

- Auto Dealers See Value of Service
- Faster Changes in Automotive Technology
- More Competition in Auto Rental Market

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3. Construction

The construction segment is divided into four subsegments:

- Office
- Multi-family residential (apartments, hotels, motels, dormitories)
- Single-family residential
- Heavy construction and industrial

The markets for construction are diverse and include:

- Industrial
- Manufacturing buildings
- Process plants
- Offices
- Retail stores
- Educational institutions
- Hospitals and clinics
- Apartments
- Power plants
- Airports
- Highways and bridges
- Waste treatment
- Waterworks
- River, harbor, and flood control projects

Construction revenues range from nine percent to 16 percent of U.S. GNP while the construction industry employs about five percent of the total labor force. In 1985, 1.5 million organizations, employing about 7.1 million individuals, were engaged in construction services. Furthermore, labor turnover is high. Less than 1% of construction firms have receipts of greater than $5 million, but account for nearly 35% of gross income and about 23% of total employment.

Interest rates profoundly influence the construction market, especially the residential market segment. After six years of double-digit interest rates, lower interest rates resulted in a "mini" residential construction boom. Changes in the federal tax law have accelerated purchases of residential units, whether single-family or multi-family.

Overall, the value of 1987 heavy construction and nonresidential building construction is expected to decline 7% and 4%, respectively. Falling oil prices have adversely affected non- residential construction in Texas, Oklahoma, Arkansas, and Louisiana, resulting in a 26% decline. Changes in federal tax laws for real estate partnerships have also reduced non-residential construction. Only construction of dams/waterworks/sewerage, schools, hospitals, and warehouses is expected to increase in 1987. Total 1987 U.S. construction value is forecast at $143.5 billion, down seven percent from $153.9 billion in 1986.

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The keys to successful construction company management include: planning, designing, estimating, negotiating, purchasing, scheduling, expediting, reviewing, and controlling.

- Cost control in construction is everything, and covers manpower, materials, machinery, and the interest expense for the funds used to finance construction.

- Obstacles to cost control and effective scheduling include the transitory nature of project-oriented construction organizations, high employee turnover, shipping delays for key products, funding snags, and inclement weather.

- Construction firms' project-oriented "tough guy mentality" has generally impeded the adoption of computer-based project management techniques.

Construction segment issues are summarized in Exhibit I-4.

EXHIBIT I-4

CONSTRUCTION SEGMENT ISSUES

- Cost Control
- Interest Rates
- Impact of Falling Oil Prices
- Firms' "Project-Oriented" Mentality

4. Hotel/Motel/Lodging

The U.S. lodging business had 1986 sales of $43.9 billion, an increase over 1985 sales of $41.8 billion. Hotels and motels employed 1.4 million persons in 1986. While there are 45,000 lodging properties in the U.S., only 3,000 have more than 200 rooms. Chain operations account for 31% of total U.S. properties but 69% of the rooms. Business travellers are the industry mainstay and represent 40% of the total U.S. lodging industry. Tourists account for 32%, government officials represent 5%, conference participants account for 18%, and others represent the remaining 5% of the U.S. hotel/motel industry. By 1990, there will be a total of

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3 million hotel rooms in the U.S. hosting, on an average day, some 2.6 million guests.

Key industry issues, summarized in Exhibit I-5, are segmentation, service, and cost control.

- Larger chains are building new types of facilities, such as small suites or budget-oriented accommodations, to serve more travellers.
- Better service is now seen as a key differentiator. Service improvements include better security and more convenient, easy-to-use, nationwide reservation systems.
- Since labor is the largest expense, lodging managers are spending for automation, improved monitoring of tasks, and improved communication between the housekeeping staff and the front desk.

EXHIBIT I-5

HOTEL/MOTEL/LODGING SEGMENT ISSUES

- Industry Mainstay: Business Travellers
- Keys: Segmentation, Service, and Cost Control
- Decreasing Occupancy Rates Due to Overbuilding

Building of new facilities in 1986 contributed to the decrease in occupancy rates from 69.0% in 1985 to 65.5% in 1986.

5. Not-For-Profit/Membership Organizations

According to the Washington, D.C.-based National Center for Charitable Statistics in 1986, 1.2 million organizations held non-profit status and employed 2.1 million persons. However, the statistic is subject to the following caveats: (a) Organizations with income of less than $5,000 are not counted; (b) of the total, 388,000 are religious groups. 25,000 groups have unrelated business income, testing IRS guidelines for non-profit organizations; (c) the statistic includes private non-profit universities and

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private non-profit hospitals; and (d) financial data for the largest universities and hospitals skews results for non-profit organizations. The net result is that there are approximately 500,000 associations encompassing trade, local, professional, and charitable groups.

According to the American Society of Association Executives, in 1986 there were 20,000 sizable national associations, compared with 19,000 the previous year; the total number is growing 5 percent per year. Some not-for-profit organizations are offering products or services which compete directly with the "for profit" sector. "For profit" companies are objecting since they pay income taxes while the non-profit organizations do not and can offer the same product or service at a reduced price or receive preferred mailing rates. Examples are widespread and include associations' publishing advertising-based magazines and selling computer software and hardware to members. Better known tax-exempt organizations include Blue Cross/Blue Shield, Underwriters Laboratories, and the National Geographic Society.

Non-profit organizations are increasingly recruiting professional managers, generally with financial or general management experience.

Due to increased legal liability resulting from product, employment, and standards-setting/certification activities of some associations, obtaining liability insurance has become increasingly difficult.

Key issues for this segment are shown in Exhibit I-6.

EXHIBIT I-6

NOT-FOR-PROFIT/MEMBERSHIP ORGANIZATION ISSUES

- Some Non-Profits Competing with For-Profit Businesses
- Non-Profit Associations Need Professional Managers
- Difficult to Obtain Liability Insurance

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6. Recreation/Entertainment

Recreation/entertainment is a $37.3 billion business and includes 173,000 organizations employing 1.4 million persons. Recreation/entertainment includes:

- Professional sports events
- Stage plays, concerts, and movies
- Golf courses and amusement parks
- Gambling
- Golf/tennis/swim/racquet/country/yacht/aviation/ hunt/gun/fishing/ riding clubs
- Agricultural fairs and expositions
- Rental of specialized sports equipment
- Sports instruction

Leisure activities are an important part of our lifestyle. They are not diminishing; in fact, revenue growth through 1991 of the movie business is forecast at 3.5% per year, prerecorded music revenues should grow at 3% per annum, and cable television will be installed in more than 50% of U.S. households in 1987.

Key issues, shown in Exhibit I-7, are business related and include:

- Recruiting and retaining employees in a typically low-paying business
- Differentiating the services offered
- Dealing with the proliferation of franchises in an industry of generally family-owned, single location enterprises
- Improving overall business management and reporting

EXHIBIT I-7

RECREATION/ENTERTAINMENT SEGMENT ISSUES

- Recruiting and Retaining Employees
- Differentiating Services
- Dealing with Franchises
- Improving Business Management and Reporting

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C

Trends in Agriculture

U.S. farm real estate debt is decreasing from its 1986 level of $92 billion.

Continued political pressure in Washington will force continued decreases in government price supports for many commodities. Grain prices are expected to decrease in the short term, then increase within three to five years as farmers grow different crops or improved strains of crops. Political pressure will slow the rate of technological change and delay the demise of moderate-sized farms.

Also, large farms' substantial economic advantages over smaller farms will likely increase. Large segments of agriculture will become vertically integrated because of efficiency, consumer demand, technological forces, and greater need for control of marketing. Major commercial payoffs of biotechnology or robotics and automation research are not expected until the early- to mid-1990s. Robots are being developed to identify and pick ripe fruit; other robots are being designed to feed cows, hook them to the milking machine, automatically milk the cow, then clean the machine.

D

Trends in Automotive Services

Automobile dealers see increasing importance of automobile maintenance services as key components of customer satisfaction. Auto service vendors are looking for ways to keep their existing customers and inexpensively prospect for new customers. As such, marketing data bases will become an increasingly important application.

Heavy competition in auto rental rates will continue as more rental agencies move from expensive main airport terminals to nearby locations. Hertz, Avis, and Budget will be forced to offer rates competitive with the smaller firms. Systems for reservations, tracking maintenance and cleaning time on each auto, and improved radio communications contribute to bottom line results.

E

Trends in Construction

In order to keep projects "on time and under budget," minicomputers and microcomputers are being used on job sites, especially for very large projects. Large construction firms are establishing interfaces between architects' computer-aided drafting and design (CADD) systems and their systems to begin to develop the bill of materials for projects. Full-scale implementation of this approach is years away until the current debate over the "liability issue of implied warranty of the architect" is resolved.

Firms are demanding more timely payroll and job costing information so that top management can be alerted promptly of project cost overruns or slipped schedules. To accomplish this, decentralized minicomputer-based operations are replacing batch processing-oriented mainframes at

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regional offices and key job sites. Additional savings have resulted from the reduction in the hardware and software support staff.

Users are reaching the limits to the power of microcomputers and are now buying minicomputers as part of their efforts to re-centralize DP operations.

The role of DP in construction organizations will evolve from a direct one to more of a coordinating role, with end users doing more system definition on computer equipment located in work areas. However, IS will be the focal point for combining voice and data information. Most construction industry executives admit that, to date, their firms have not integrated IS into the company planning process. With the array of hardware and software available, managers are challenged to determine how the computer system, as a construction tool, enhances company profitability.

Project related data generally resides at the job site; corporate reporting data is transmitted to the computer at the headquarters.

Large construction firms use different approaches to purchasing software; some firms prefer to purchase off-the-shelf while others prefer to develop application in-house applications. Some large companies purchase micro-based application software (spreadsheets, word processing, scheduling, marketing), but develop programs in-house for the business and engineering part of the business.

Of 142,000 National Association of Home Builders (NAHB) members, 46,000 are builders. As of August 1986, only 25% of this number had computers; however, the proportion is expected to rise rapidly to 75% by 1989.

F

Trends in Hotel/Motel/Lodging

According to one industry watcher, consolidation will reduce the number of lodging chains from 65 to approximately 40 by 1988. While recreational travel fluctuates widely, hotels are aggressively pursuing business conventions and seminars to help actively utilize large, expensive facilities.

Key hotel/motel applications include: guest services, accounting and finance, information system management, environmental systems, employees and employee records, office automation, and communications.

Only 40% of hotels have an integrated hotel management system.

- An integrated hotel management system integrates property management, energy management, automatic temperature control, telecommunications, and fire and security systems modules.

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- The system purchase is justified on the basis of cost reduction, increased operating efficiency, enhanced customer service, and improved guest comfort.

- The most important system features, in decreasing order, are: linking fire safety modules to the integrated management system, permitting housekeeping staff members to report room status on a real-time basis to the front desk using a digital telephone as keypad, and integrating energy management and automatic temperature control with other hotel management systems.

Opportunities for vendors include: sales of marketing-oriented data bases, electronic locking systems (ELS), time-and-attendance systems, point-of-sale (POS) systems, and, especially, turnkey hotel management systems. Other vendor opportunities include: integrating information among existing systems, teleconferencing facilities, and hotel-based information services.

G

Trends in Not-for-Profit/ Membership Organizations

Dues pay for only 48% of the operating expenses of industry associations. Savvy organizations find creative ways to raise additional funds.

As organizations seek ways to raise funds, in-house computerization will increase. Applications include: mailing lists, marketing/demographic/membership data, orders for reprints, merchandise inventories, convention management, monitoring investments and endowments, strategic planning, calendar management, and fund raising. Data base software is common to the above applications and, as such, will play a pivotal role in association management. More sophisticated users will demand custom programming beyond the basic capabilities of programs such as dBase III.

Not-for-profit/membership organizations, like for-profit businesses, are trying to develop integrated offices linking telephone communications, electronic mail, facsimile transmission, and word processing.

H

Trends in Recreation/ Entertainment

Professional sports teams are competing more for fans' entertainment dollars. Teams are taking bold steps to: attract top talent, relocate to growing cities, extend seasons and league revenues through longer seasons, and offer varied seating arrangements for fans. This is expensive!

As a result, teams are spending more for computers to better track player performance, team prospects, group and individual ticket sales, and promotional events held in conjunction with scheduled games.

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While new applications have been devised, basic team requirements for integrated accounting and financial software, airline scheduling, logistics management, videotape library management, and other basic applications continue. In summary, systems have been devised to aid all facets of sports team and event management.

Tailor-made accounting and project management software has been developed for stage plays and movie production. Integration of disparate applications software modules is the next challenge.

I Factors Limiting Growth

Factors that have held back growth in the "other industry" information services market include:

- Operations-oriented, rather than strategic-oriented, senior management that emphasizes cost control as opposed to using information as a service differentiator.
- Wide fluctuations in revenues and profits in agricultural, mining, and construction businesses as a result of general economic health whipsaw annual spending for information products and services.
- Vendors of information services products do not offer integrated products, packaged individually so that the buyer can add one or two modules per year to complete a system. High entry system cost deters purchases.
- Unionization prevents upgrading of certain job classifications through automation.

The costs of serving rural populations may be greater than the benefits gained, especially in the agriculture sector. Farming is also characterized by relatively low sales volume compared to other vertical markets. Furthermore, farmers vary by geographic location and applications needed. Rural cultures are also slower to change and adapt new technology.

J Factors Spurring Growth

Due to the diversity of the "Other Industry" sector, the factors spurring growth will be discussed separately for each segment.

1. Agriculture

The top priority for farmers is reducing costs in order to remain competitive. Medium-sized farms benefit from automated assistance in acreage utilization planning, purchasing, and cash flow modeling. Large agribusiness organizations can automate all aspects of their operations. Applications extend beyond financial ones to include logistics, fixed asset management, major customer data bases, and personnel records.

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The livestock segment is doing better than the grain and other crop segment. In the livestock segment, computerization is more appropriate and includes animal husbandry and production records.

The use of robotics will lower the cost of picking fruit. Currently, 30% of the retail price of a piece of fruit stems from the cost of picking it. Future machine-based fruit pickers will rely on a combination of machine vision, artificial intelligence, and mechanical arms.

Personal computers have not penetrated the agricultural market. Fewer than 10% of the country's 600,000 full-time farmers own personal computers, whereas 30% of non- agricultural businesses do.

Key segment applications include: animal health records, individual crop profit and loss analysis, parts inventory, equipment management, farm accounting, dairy system, breeding management, market and price analysis.

2. Automotive Services

The automotive services segment is driven by the high level of competition for customers, the need to offer convenience to customers, and the desire to differentiate its customer services. Key applications include: Inventory management, marketing information, employee records, employee productivity measurement and computation of wage bonuses, work in process monitoring, and job estimating.

3. Construction

Forces driving demand by the construction segment for information services include the realization by senior management that more business-like methods may be applied to managing what has been a "rough and tumble" business. While such variables as inclement weather, subcontractors with different skill levels, and delays in receipt of building materials, construction managers now realize that the overall project must be scheduled and include financial controls. Increased competition also spurs demand for computers, software, and other information services. Rapid acquisition of microcomputers by the construction industry presents challenges and opportunities for vendors of local area networks (LANs), multi-user systems and construction industry application software.

4. Hotel/Motel/Lodging

The lodging industry is driven by a need to attract more customers and cultivate chain loyalty. Since the market is nearly saturated, growth for one firm will be at the expense of another firm. Automation of labor

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intensive tasks such as housekeeping or food and beverage service and automation of such environmental factors as security, heating/ventilation/air conditioning and other areas of potential liability is a key driving force. Increased competition in highly competitive lodging and food/beverage markets drives demand for information services. Microcomputer-based lodging industry applications, especially those tailored for smaller hotels and motels, will spur sales of related information services.

5. Non-Profit/Membership Organizations

Fund-raising and improved service are key driving forces for non-profit organizations. Since non-profits' income from direct fees is not sufficient to cover expenses, there is tremendous pressure to raise funds through means outside the organization's principal activity or objective. Membership organizations are driven by the need to provide services and specific information and maintain member records.

Information service suppliers should concentrate on microcomputer-based software for small business management, employee information, list management, marketing information, reprint fulfillment and shipping, library operations, article reprint management, and management of endowments or investments.

6. Recreation/Entertainment

Recreation and entertainment is a big, varied business. Software and services must be tailored to meet specific market needs. Key applications include: event scheduling and management, tracking royalty payments, accounting and finance, ticket sales, measuring the effectiveness of special promotions, and logistics management. Since the industry is heavily dependent on consumer tastes and trends, software for analyzing consumer demographic information is necessary.

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III

Market Forecasts

II

Market Forecasts

A

Introduction

INPUT divides the "Other Industry" sector into six major segments, listed alphabetically:

- Agriculture, Forestry, Fishing
- Automotive Services
- Construction
- Hotel/Motel/Lodging
- Not-for-Profit/Membership Organizations
- Recreation/Entertainment

The Standard Industrial Classification (SIC) Codes for each major segment and a detailed definition of each segment were listed in Exhibit I-1.

Exhibit II-1 summarizes the number of U.S. firms, number of employees, and estimated 1986 receipts for segments in the "Other Industry" sector. Construction produces the most revenues and has the greatest number of employees. Agriculture has the greatest number of business enterprises. Not-for-profit/membership organizations account for nearly twice the revenue of hotel/motel/lodging or automotive services.

Demand for "other industry" applications will grow 15% annually through 1991, increasing from $774 million to $1,602 million. Exhibit II-2 shows user expenditures through 1991 in the "other industry" sector.

It is tempting to say that firms within each market segment have similar requirements which can be nicely met with off-the-shelf software. In fact, the data processing needs of firms within each segment differ widely, based primarily on the size of the enterprise.

- For example, large agribusiness ventures need sophisticated software to manage all aspects of a near-billion dollar business while a family farm needs rudimentary microcomputer-based farm managment software.

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- Similarly, the needs of small construction firms differ significantly from those of multi-national project design and construction management firms.

- As a result, successful vendors to these markets are able to provide custom software or modify off-the-shelf software to fit the client's need.

EXHIBIT II-1

"OTHER INDUSTRY" SECTOR
NUMBER OF FIRMS, EMPLOYEES, AND 1986 REVENUES

INDUSTRY SECTOR	NUMBER OF FIRMS	NUMBER OF EMPLOYEES	1986 INDUSTRY REVENUES* (Billions of Dollars)
Agriculture	2,200,000	2,700,000	89.3
Forestry	3,200	900,000	1.2
Fisheries	4,000	300,000	2.4
Automotive Services	140,000	975,000	42.4
Construction	1,500,000	7,100,000	153.9
Hotel/Motel/Lodging	45,000	1,400,000	43.9
Not-for-Profit/Membership Organizations	1,2000,000	2,100,000	79.3
Recreation/Entertainment	960,000	1,400,000	37.3

* INPUT Estimates

Source: Based on data in 1986 Statistical Abstract of the United States

Distribution channel usage plays a subtle role. Owners of small farms, small and medium automobile repair shops, small lodging operations, small construction firms, and small recreation/entertainment enterprises are more likely to begin their search for computer-based solutions at a local computer store. It makes little sense for a manufacturer's direct

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sales force to sell solutions available for microcomputers when only minicomputers and mainframes are most efficiently sold directly by the vendor.

EXHIBIT II-2

"OTHER INDUSTRY" SECTOR USER EXPENDITURE FORECAST, 1987 - 1992

Segmentation By Delivery Mode	1986 ($M)	86-87 GROWTH (Percent)	1987 ($M)	1988 ($M)	1989 ($M)	1990 ($M)	1991 ($M)	1992 ($M)	AAGR 87-92 (Percent)
Processing Services									
Remote Computing	561	14	637	713	792	871	950	1032	10
Facility Management	10	10	11	12	13	15	16	18	10
Total Processing Services	571	13	648	725	805	886	996	1050	10
Applications Software									
Mainframe/Mini	88	36	120	155	190	226	262	299	20
Micro	9	56	14	21	32	46	66	93	46
Total Applications Software	97	38	134	176	222	272	328	392	24
Turnkey Systems	112	17	131	151	170	189	206	221	11
Sector Total	780	17	913	1052	1197	1347	1500	1663	13

B

Demographic Forecast

As a result of economic conditions, the number of farms will decline between 1986 and 1991. Government subsidies to farms are expected to lessen or change significantly, causing many farms to consolidate of close. Changing economies of scale will force consolidation of some small farms and medium-sized enterprises. The consolidated farms will be located near one another to share expensive tools and equipment.

The number of automotive services businesses will increase. Auto service providers are moving toward increased specialization, such as oil-filter-lube operations; brake shops; muffler shops; and auto detailing shops. The creation of suburban "auto service centers" is driving the growth of auto service enterprises. These suburban auto centers, with longer operating hours, are necessary to successfully serve two-income families who have less time available to do necessary chores.

The number of construction enterprises will increase slightly overall, owing to more foreign enterprises and more highly specialized subcontractors. Overall long-term prospects for residential, industrial, government, and commercial construction are good.

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Long-term prospects for hotel/motel/lodging are good, since discretionary income is rising and people generally have more paid vacation time for travel. The trend toward diversification in property types will continue, although at a slower pace.

The number of large non-profit/membership organizations will increase approximately 5% per year during the forecast period.

The number of motion picture theaters will decrease slightly during the forecast period. The increase in videocassette rentals will have the greatest impact on "non-first run" theaters in large and medium cities. The number of other amusement-based businesses will decrease slightly as a result of more mergers and acquisitions; surviving organizations will be good prospects for increased computerization.

C

Agriculture

Although there are about 2.2 million farms, expenditures for software and services by this segment accounts for approximately 15% of total "Other Industry" information services expenditures. Information services spending by forestry and fishery firms represent 0.5% and 0.8%, respectively, of total sector spending. Information services spending by the 100 largest agribusiness enterprises represents 65% of total agriculture segment spending for information services.

D

Automotive Services

Information services expenditures by the 140,000 auto service organizations account for 2% of total "Other Industry" sector IS expenditures. Information services spending by the largest auto repair and maintenance companies represents 50% of total auto services segment spending for information services.

E

Construction

Information services spending by the 1.5 million construction enterprises accounts for 65% of total "Other Industry" IS spending. Spending by the 100 largest construction firms accounts for 45% of total construction IS spending.

F

Hotel/Motel/Lodging

IS spending by the 45,000 hotel/motel firms represents 7.5% of total sector IS spending while IS spending by the largest 100 lodging chains represents 60% of all lodging firms' IS expenditures.

G

Not-for-Profit/ Membership Organizations

IS spending by the 1.2 million non-profit/membership organizations represents 6.1% of total sector IS spending. An estimated 8% of all non-profit organizations receive donated computer hardware. Apple Computer's "Apple Education Foundation" actively donates Macintosh hardware to qualifying organizations. The largest 100 non-profit/mem-

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bership organizations account for 35% of total non-profit/membership organization IS spending.

H

Recreation/ Entertainment

IS spending by the 960,000 recreation/entertainment firms accounts for 2.5% of total sector IS spending, while IS spending by the largest 100 recreation/entertainment firms represents 30% of total recreation/entertainment firm IS expenditures.

I

Delivery Mode Forecasts

1. Processing Services

Expenditures for processing/network services, which represent more than 70% of "Other Industry" IS expenditures, are expected to grow 10% annually through 1992. The heaviest users of processing/network services are concentrated in just four vertical markets – lodging, automobile rentals, agriculture, and non-profit organizations.

- Major processing services for the lodging industry systems are provided by American Airlines' (SABRE), Best Western, Ramada Inns, Hilton Hotels, and Sheraton Hotels.

- The largest processing services for auto rental companies include SABRE, Hertz, Avis, Budget, and National who also provide services for smaller agencies.

- Many networks serve the agricultural community, chiefly ones for commodity and crop price reporting, accounting, weather data, and federal government regulations. AgNET and AgriStar are the best known on-line networks.

- Industry associations, especially those located in Washington D.C. and which provide lobbying efforts, use Legi-Slate, Washington Alert Service, or Information for Public Affairs to monitor legislation.

Despite inroads by minis and micros, demand for processing services is expected to increase due to the timeliness and breadth of information required by this sector. CD-ROM- based updates may have a slight negative impact on the growth rate but, in general, timeliness and completeness of information spurs demand for processing/ network services.

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INPUT divides industry segment usage of processing/network services into:

- Lodging: 45%
- Automobile rentals: 25%
- Agriculture: 15%
- Non-profit organizations: 10%
- Others: 5%

2. Turnkey Systems

Turnkey systems sales account for slightly more than 14% of total 1986 industry sector user expenditures. Due to an increase in computer users' skills, sales of turnkey systems will increase at 11% through the forecast period, versus overall sector growth of 13%. Turnkey sales continue to account for a relatively large proportion of sector user expenditures. Turnkey systems' relative strength is attributable to the realities of selling to vertical markets with technically unsophisticated buyers.

- Buyers in these industries do not want the steep technical "learning curve" associated with the purchase of computers; they would rather tend to their primary business responsibilities.

- It is easier for the sales representative to sell a complete system and follow-on maintenance services than to sell the hardware or software separately.

- Turnkey systems represent solutions for applications which do not have to be integrated with, say, an organization's main accounting system. Most office-based applications in agriculture, auto services, construction, lodging, non-profit organizations, and recreation/entertainment are effectively handled with a turnkey system.

3. Applications Software

Applications software accounts for 12% of total 1986 user expenditures in the "Other Industry" sector and will increase at an overall 24% annual rate through 1992. The disparity between expenditures for mainframe/minicomputer and microcomputer applications software can be explained starting with the installed hardware at the largest organizations.

- Recall that the largest organizations represent the greatest part of user expenditures in each of the six vertical segments.

- According to INPUT's research, the largest organizations in each segment have purchased mainframes and minicomputers to a far greater extent than non-turnkey system microcomputers.

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Furthermore, while many vendors sell microcomputer applications software to these six industry segments, no vendor is large enough to significantly influence segment revenues. Note, too, that none of the leading 200 Information Services vendors sell to these particular industry segments.

Steep discounts for microcomputer software or donated hardware for non-profit organizations and key reference accounts in these industries yield relatively low dollar sales.

Key applications by sector include:

- Agricultural: Crop, dairy, & feed management; accounting; reporting; real estate analysis; grain inventory management; and crop broker management.

- Automobile services: Labor reporting; parts inventory; accounting; payroll; rental management; and preventive maintenance.

- Construction: Project management & accounting; payroll; job costing; subcontract management; purchasing; government reporting; service contracts; equipment cost; progress billing; bid analysis; and concrete estimating.

- Hotel/Motel/Lodging: Reservations; accounting; front office/ night auditor; staffing; payroll; food and beverage control; guest history; telephone call accounting; room rate analysis; sales management; groups and conventions management; and purchasing.

- Non-profits: Grant management; payroll; accounting; mail list management; exhibition management; membership management/renewal billing; contribution reporting; publication inventory; donor information; ID cards; and long-range planning.

- Recreation/Entertainment: Accounting; payroll; ticket sales management; inventory; frequency of use; cart rental and service management; stamp & coin collection inventory; marina and yacht club management; league management; scouting and player rating; and weight/fitness/ performance evaluation.

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III

Competitive Developments

III

Competitive Developments

A

Introduction

Competition in the "Other Industry" vertical sector is relatively intense. However, the major effort is convincing users in low-margin businesses to make the initial investment in computers.

B

Acquisitions

Following a review of INPUT's mergers and acquisitions data base back to 1984, no IS vendors merged or were acquired in the "Other Industry" sector.

C

Vendors Entering/ Exiting the "Other Industries" Market

No major IS vendors were identified who entered or exited the "Other Industry" sector between January 1984 and September 1987.

D

Vendor Profiles– Agricultural Segment

1. Pioneer Hy-bred International; Des Moines, Iowa

- Products/Services: Applications Software
- Revenue Range: $10 - $15 million

2. Harris Technical Systems; Omaha, Nebraska

- Products/Services: Applications Software
- Revenue Range: $1 - $3 million

E

Vendor Profiles– Automotive Services Segment

1. Automotive Computer Group; Clearwater, Florida

- Products/Services: Applications Software
- Markets Served: Auto Repair Shops
- Revenue Range: $1 - $3 million

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2. Other Vendors:

- Repair Shop Systems; San Rafael, CA
- Softkey Software Products; Toronto, Ontario

F

Vendor Profiles–Construction Segment

1. Timberline Systems; Beaverton, OR

- Products/Services: Applications Software
- Revenue Range: $10 - $15 million

2. Concord Management Systems; Tampa, FL

- Products/Services: Applications Software
- Revenue Range: $10 - $15 million

3. TOM Software, Inc.; Seattle, WA

- Products/Services: Applications Software
- Revenue Range: $3 - $5 million

G

Vendor Profiles–Hotel/Motel/Lodging

1. EECO Computer, Inc.; Santa Ana, CA

- Products/Services: Applications Software
- Revenue Range: $10 - $15 million

2. Computerized Lodging Systems, Inc; Long Beach, CA

- Products/Services: Applications Software
- Revenue Range: $3 - $5 million

3. Hotel Information Systems; Pleasant Hill, CA

- Products/Services: Application Software
- Revenue Range: $3 - $5 million

H

Vendor Profiles–Not-for-Profit/Membership Organizations Segment

1. TOM Software, Inc.; Seattle, WA

- Products/Services: Applications Software
- Revenue Range: $3 - $5 million

2. Smith, Abbott & Co., Inc.; Baltimore, MD

- Products/Services: Applications Software
- Revenue Range: $3 - $5 million

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3. Quodata Corp.; Hartford, CT

- Products/Services: Applications Software
- Revenue Range: $3 - $5 million

I

Vendor Profiles–
Recreation/
Entertainment
Segment

1. BetaData Systems, Inc.; Tucson, AZ

- Products/Services: Applications Software
- Revenue Range: $1 - $3 million

2. ADS Software, Inc.; Roanoke, VA

- Products/Services: Applications Software
- Revenue Range: $1 - $3 million

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Information Systems Outlook

IV

Information Systems Outlook

A

Major Issues

1. Driving Forces

Exhibit IV-1 lists driving forces common to all sectors within the "Other Industry" market segment.

EXHIBIT IV-1

"OTHER INDUSTRY" DRIVING FORCES

- Tax Reform
- Decentralized Business Operations
- Management Tools and Techniques Required
- Employee Training and Retention

- Tax reform is changing accounting policies and procedures, forcing IS departments to modify existing accounting systems to the new requirements.

- Advancing network technology and more powerful personal computers are fueling the drive toward decentralized systems in all industries.

- To a lesser extent, senior management realizes the need for more professional tools and techniques to manage increasingly complex businesses.

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- Many organizations within the "Other Industry" sector share business characteristics with service businesses. For example, the success of non-profit organizations,leisure/recreation, lodging, and automotive services are dependent on the training and skill level of employees. As a result, employee training and retention are more important than in the past.

Key segment specific driving forces, which are covered in detail in Section I, are: (a) Agriculture: Cost reduction; (b) Automotive Services: Increased competition; (c) Construction: Professional management required; (d) Lodging: Increased competition; (e) Non-Profit Organizations: Provide more services; and (f) Recreation/Entertainment: Professional management required.

2. Issues and Objectives

Exhibit IV-2 lists fundamental IS department issues and objectives common to all sectors within the "Other Industry" market segment. The role of IS management will change from that of guru to one of facilitator, supporting end-user computing.

EXHIBIT IV-2

"OTHER INDUSTRY"
ISSUES AND OBJECTIVES

- End-User Computing
- Connectivity and Integration
- Education, Training, and Support
- Technology Directions

- Connected hardware and integrated software facilitates information dissemination throughout an organization or between organizations. Integrated software makes data available to many applications without costly and time-consuming duplicated data entry.

- Non-hardware and system software issues will dominate users' needs when purchasing a system or applications software. Vendors must provide better education, training, and support to enable users to gain maximum productivity from their systems.

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- Managers must be versed in general developments in technology to enable their company to gain maximum benefit from new products and services.

3. Impact of New Technology

a. Agriculture

According to Dun's Business Monthly, three to five percent of small and medium farms will cease operations for the next four to five years. Automated systems will play a major role in marketing and operations strategies. Just as automated systems are far more cost-effective for large corporations than for small ones, automated systems will have a greater effect on large agribusinesses than small farms.

b. Automotive Services

Communications technology has provided the foundation for on-line reservations systems. New software helps auto services firms manage vehicle maintenance, repeat customers, customer complaints, repair procedures, and sophisticated diagnostics.

c. Construction

Overall, computer technology is slow to take hold in the construction industry due to the unusual nature of construction projects; no construction site is permanent and the
organization of labor changes constantly as subcontractors come and go.

Automation of field operations is the area of most rapid IS development in construction. Previously, construction IS consisted almost entirely of accounting and office applications. Project management and integrated software now represent key construction applications.

Integrated applications include: computer aided design and drafting (CADD) and estimating, cost accounting and project management, and bidding and materials management.

d. Hotel/Motel/Lodging

Video conferencing in the lodging sector has had two opposing but roughly balanced effects. Teleconferencing reduces long-distance business travel yet requires use of the local hotel to receive and transmit video and voice images. Property management systems act as information system hubs, tying disparate functions into one system. Electronic door locking systems reduce theft, significantly reduces the cost of rekeying room keys when keys are lost, and provides an audit trail of employees

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entering and leaving a guest's room. Energy management systems are essential for large lodging operations since a 10% reduction in energy costs translates into a substantial gain in pre-tax profit.

e. Not-for-Profit/Membership Organizations

While associations and non-profit organizations are typically small, their IS budgets are growing to reflect increasing computerization. IBM PC clones and inexpensive application software help to efficiently provide basic membership services. On-line databases support fundraising and mail list management applications.

f. Recreation/Entertainment

Point-of-sale (POS) and telecommunications technology enable faster reporting of sales and subsequent demographic analysis of movies. Scheduling applications help reduce the cost of movie production. Local area networks (LANs) link multi-site locations of recreation businesses, such as amusement halls and private clubs, enabling information to be assembled and analyzed in a more timely manner.

B

New Applications

One promising new application is that of data bases which integrate information from previously unlinked sources. Examples include weather and crop prices and customer profiles connected to auto/lodging reservation systems

Another new application is that of providing information on specific vertical industries to institutions serving them, such as commercial and savings banks, insurance companies, mortgage insurers and brokers, and suppliers of raw materials.

Microcomputer clone-based turnkey systems can automate repetitive manual tasks and provide management information in agriculture, construction, and the food and beverage portion of the lodging industry, among others.

Improved applications software for benefits management, subcontractor management, project management, purchasing, equipment service and maintenance, "event" or exhibition management, and long-rage planning should be useful across all "Other Industry" sectors.

C

Budget Analysis

Personnel is by far the largest budget category, accounting for 44% of IS budget expenditures. Please see Exhibit IV-3.

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EXHIBIT IV-3

1986 BUDGET DISTRIBUTION AND 1986/87 CHANGES IN THE "OTHER INDUSTRY" SECTOR

BUDGET CATEGORY	1986 PERCENT OF U.S. BUDGET (Percent)	1986-87 EXPECTED BUDGET GROWTH (Percent)
Personnel	44.0	7.0
Mainframe Processors	13.0	7.0
Minicomputers	6.0	8.0
Microcomputers	6.0	17.0
Mass Storage Devices	4.0	10.0
Other Hardware	11.0	13.0
Total Hardware	40.0	11.0
Data Communications	4.0	10.0
External Software	4.6	22.0
Professional Services	1.4	8.0
Software Maintenance	1.5	19.0
Hardware Maintenance	1.5	22.0
Other	3.0	5.0
Total	100.0	10.0

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The next largest expenditure category is hardware, at around 20%. Mainframe systems account for 29% of hardware expenditures. Expenditures for microcomputers are the fastest growing item in the hardware portion of the IS budget.

"External software" and "hardware maintenance" are the fastest growing line items in the overall budget, each growing at 22%. "Software maintenance" is the second fastest growing item of the overall budget with a 19% growth rate.

Companies in the "Other Industry" sector developed 70% of all software in-house. They purchased the remainder as packaged software or had it developed outside. Please refer to Exhibit IV-4 for details. According to Exhibit IV-5, 60% of the programming staffs of "Other Industry" companies provide maintenance and enhancements to existing applications; the remaining 40% develop new applications software.

EXHIBIT IV-4

IN-HOUSE DEVELOPED VS. PURCHASED SOFTWARE "OTHER INDUSTRY" SECTOR

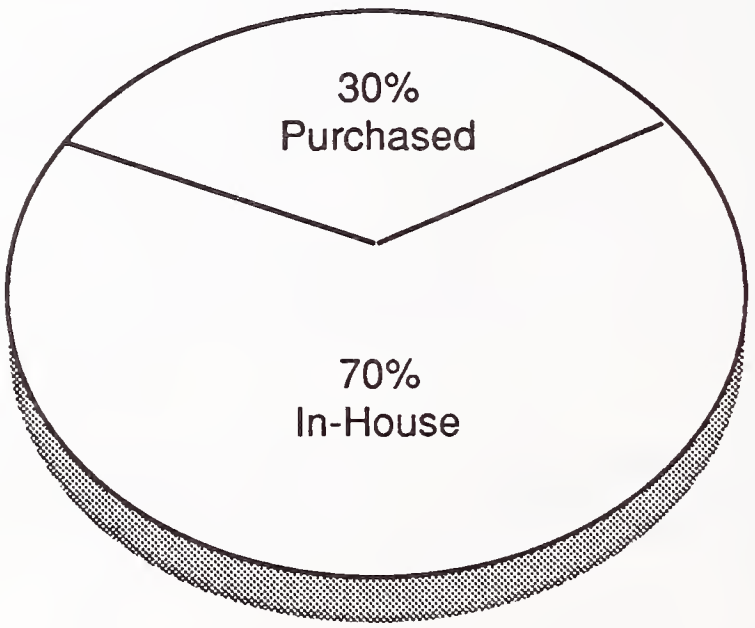

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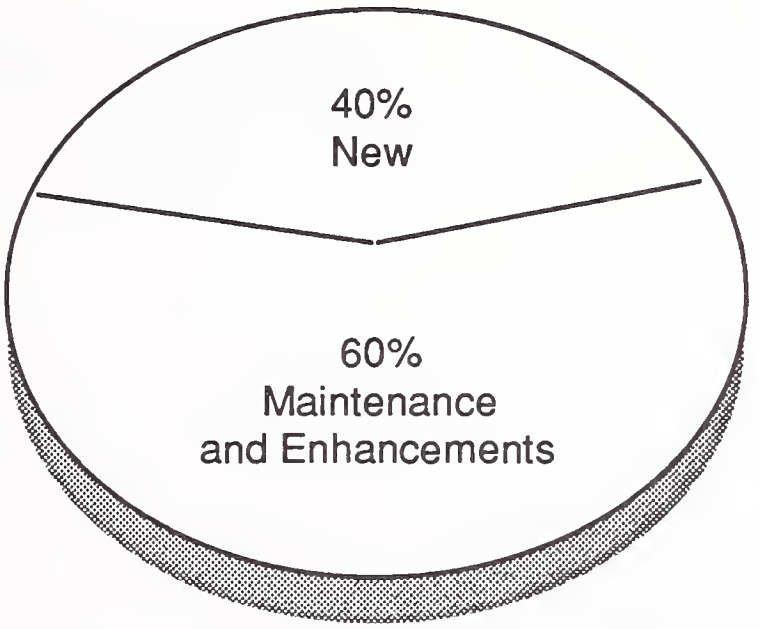
EXHIBIT IV-5

PROGRAMMING STAFF ASSIGNED TO NEW APPLICATIONS VS. MAINTENANCE OF EXISTING APPLICATIONS "OTHER INDUSTRY" SECTOR



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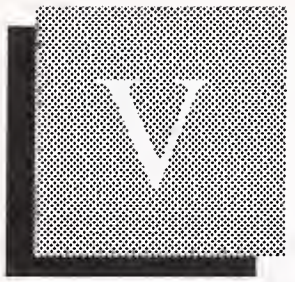

Conclusions and Recommendations

V

Conclusions and Recommendations

The "Other Industry" sector is very large, diverse, and overall represents a good market opportunity for IS vendors.

The segments range from agriculture and construction to knowledge intensive service industries such as automotive repair and such creative enterprises as movie production.
Combined organization revenues for the six market sub-segments equalled nearly $450 billion in 1986. This sector is a good opportunity for IS vendors since the level of overall computerization is relatively low in nearly all segments. The major exception is the extensive processing networks used by the auto rental companies.

Vertical market applications software, especially single-user and multi-user microcomputer-based, is expected to grow much more rapidly than "Other Industry" delivery modes.

- Medium-size farms represent the best opportunity for sales to the agricultural segment since they have not been heavily penetrated and, overall, have reasonable prospects for success, given the industry's shakeout.

- Independent auto repair services could accommodate an easy-to-use microcomputer-based system for computing labor and inventory efficiency.

- Potential construction applications include:
  - Personnel records and benefits
  - Subcontractor monitoring and management
  - Material estimating
  - Space layout

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- Target niches for IS in the hotel/motel/lodging market are:
  - Convention/event management
  - Bed 'n Breakfast facilities
  - "European" style hotels

- Non-profit organizations could use software to help:
  - Operate the "for profit" portions of their business
  - Manage association publications
  - Manage seminars
  - Provide better records for fundraising
  - Manage local political campaigns

- Within the sports/recreation segment, consider:
  - Theme park management
  - Management of musicals, and plays by local music and theatre groups (which may, coincidentally, be set up as non-profit organizations)

In order to initially penetrate areas where IS purchases have been small, a great deal of hand-holding will be necessary. When pricing the product or service, vendors should take into account increased customer support costs.

Since there are virtually no "powerhouse" applications software suppliers, a larger firm with strong marketing, sales, and sales support muscle could make significant inroads in one or more diverse market segments.

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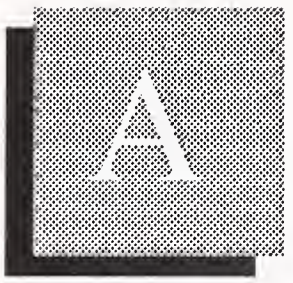

Appendix: Forecast Data Base: "Other Industry" Sector

A

Appendix: Forecast Data Base; "Other Industry" Sector

Forecast Reconciliation

Since there were no major differences between previous INPUT forecasts and 1986 results, no reconciliation is necessary.

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About INPUT

INPUT provides planning information, analysis, and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, and communications and office products and services.

The company carries out continuous and in-depth research. Working closely with clients on important issues, INPUT's staff members analyze and interpret the research data, then develop recommendations and innovative ideas to meet clients' needs. Clients receive reports, presentations, access to data on which analyses are based, and continuous consulting.

Many of INPUT's professional staff members have nearly 20 years of experience in their areas of specialization. Most have held senior management positions in operations, marketing, or planning. This expertise enables INPUT to supply practical solutions to complex business problems.

Formed in 1974, INPUT has become a leading international planning services firm. Clients include over 100 of the world's largest and most technially advanced companies.

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Accounting Sector

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DECEMBER 1987

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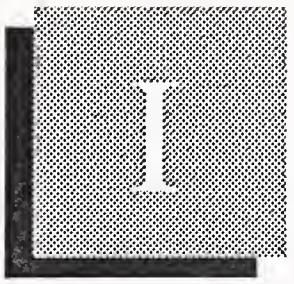
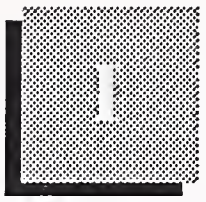


Issues, Trends, and Events



Issues, Trends, and Events

A Introduction

The accounting function is broad, and includes the following specific functions:

- Accounts payable.
- Accounts receivable.
- Billing/Invoicing.
- Costing.
- Fixed assets.
- General ledger.
- Integrated accounting.
- Payroll.
- Other.

Related applications that integrate with accounting modules include:

- Order entry.
- International accounting (currency conversion, value-added taxation, and consolidation).
- Sales lead tracking.
- Purchasing.
- Financial modeling.
- Accounting tailored for specific industries.
- Sales analysis.
- Management reporting.

Financial modeling and sales analysis are discussed in the section on Planning and Analysis. Sales lead tracking, order entry, and sales management reports are covered in the section "Other Cross Industry Sector." Payroll is discussed in the Human Resources cross-industry sector.

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Accounting expenditures represent the sixth largest of 25 major market segments tracked by INPUT. In 1987, end users spent nearly $2.8 billion for cross-industry accounting software and services.

B

"GLAPPAR"

"GLAPPAR" is an accounting shorthand reference for General Ledger, Accounts Payable, Payroll, and Accounts Receivable, the four core accounting applications. Accounting software has traditionally been sold as individual modules for two reasons. First, individual modules can be priced at levels within the approval range of local managers. Accounting software modules for personal computers generally have a maximum price of $400, consistent with the signature authority of local managers. Minicomputer and mainframe computer accounting modules are generally priced within the purchase limit for the division manager. Second, the purchase decision becomes one of buying three or four modules versus one expensive, complicated program. Customers can try one or two modules before committing to the purchase of a new accounting program.

Key trends in "GLAPPAR" accounting software include:

- An evolution from batch to on-line transaction-based software containing "what if" capabilities for budget projections and compliance with government agency reporting requirements.
- The continuing transition from individual modules with multiple-keystroke entries to integrated modules where information is updated in all relevant modules with a single keystroke.
- A general movement from financial-accounting-oriented software to software that not only satisfies financial accounting needs, but also management accounting and management reporting needs.
- More flexibility in accounting software, allowing the developer to tailor portions of the product to meet customer requirements.
- More personal-computer-based accounting software, especially versions operating on networks of PCs.
- A movement from VSAM-based to DBMS-based files permitting better security and layering of data.

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C

Other Accounting Applications

The increase in international business for U.S. companies has increased the need for accounting software to support multinational operations.

The use of fourth generation languages to assemble management reports from data scattered across the system and physically located in separate data bases is an outgrowth of the trend toward integrated corporate information.

D

Events

In 1986, the U.S. Congress and the President approved a major revision to the tax code for individuals and businesses. Software for depreciation, investment tax credit computation, and multinational accounting required modification.

E

Products

New accounting software differs significantly from previous-generation products. The latest accounting products are able to accommodate more files (especially valuable for holding many invoices or accounts receivable), are designed for on-line use, and can easily generate custom reports for management. This new "generation" of products fully utilizes the expanded main memory capacity of the host computer system. Organizations with single-user-based accounting are asking for network versions of accounting software.

As part of a symbiotic relationship, full-featured accounting software helps sell more hardware.

Support for more transactions per second for mainframe/minicomputer software represents another trend in accounting software product features.

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II

Market Forecasts

II

Market Forecasts

A

Introduction

User expenditures for accounting cross-industry applications will grow 7% annually through 1992, increasing from $2.7 billion to $3.9 billion in 1992. For details, please refer to Exhibits II-1 and II-2.

- Mainframe/minicomputer accounting software will enjoy a relatively high growth of 10% annually from $995 million in 1987 to $1.6 billion in 1992.

- Microcomputer-based accounting will grow fastest, at 15% annually, from $339 million in 1987 to $692 million in 1992.

- Turnkey systems will grow relatively slowly from $414 million in 1987 to $514 million in 1992, an annual growth rate of only 4%. For the "accounting cross-industry" application, turnkey systems refer to the value of the accounting portion of the total price of an industry-specific or application-specific turnkey system.

B

Processing/Network Services

With the plethora of computer-based accounting software, one would not expect much of a market for accounting-oriented remote/batch computing services. In fact, remote/batch computing service-based accounting is a $1.0-billion-a-year business. Why is this so?

- Large national and regional accounting firms offer on-line or batch accounting services for customers as a "lock-in" to that firm's accounting and auditing services.

- Industry associations offer members discounted accounting services at a fee over the basic membership charge.

- Wholesalers are offering accounting services to retailers to maintain a business relationship. Most often, these services are provided to retail-

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EXHIBIT II-1

ACCOUNTING SECTOR FORECAST
CROSS-INDUSTRY INFORMATION SERVICES, 1987-1992

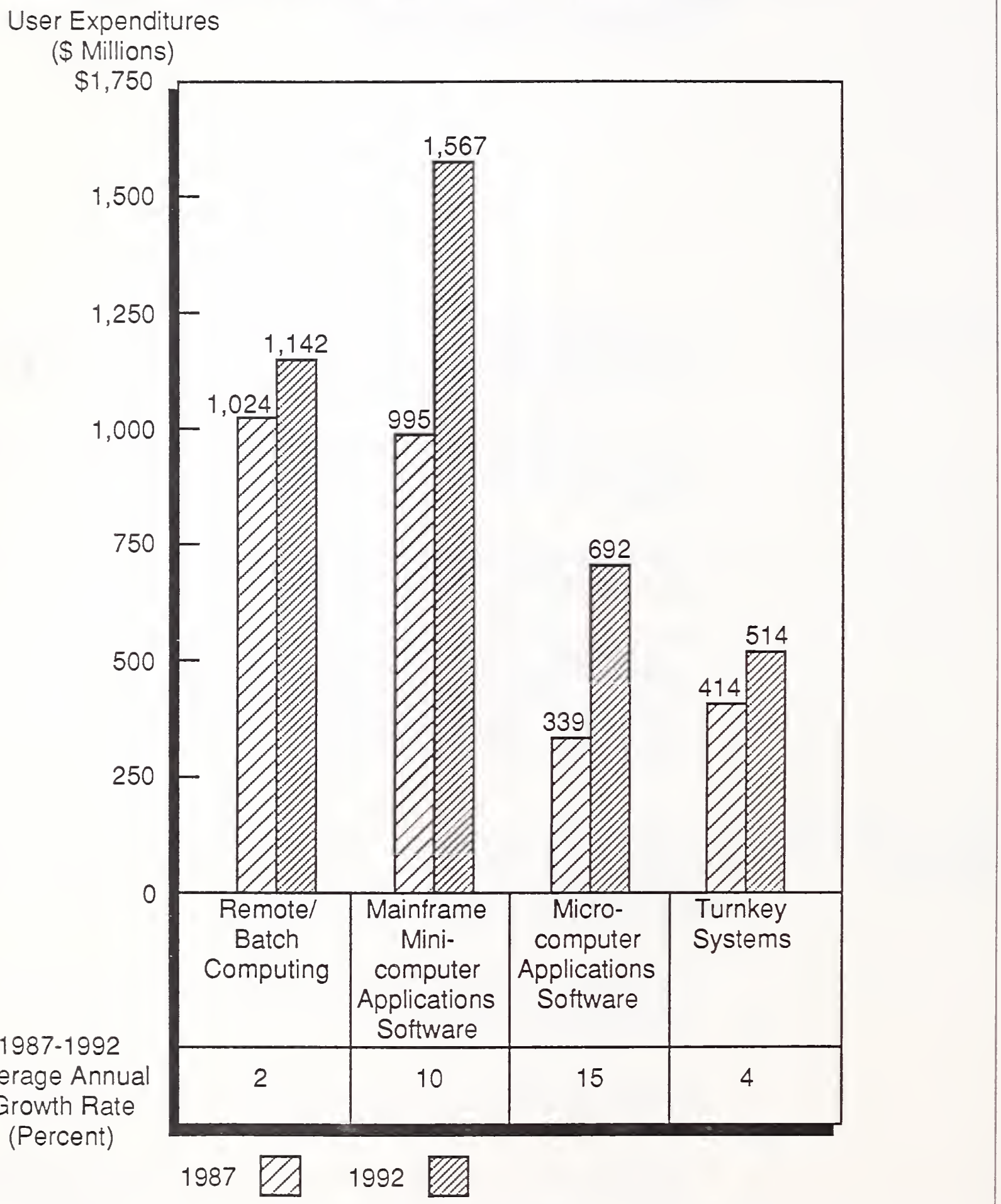

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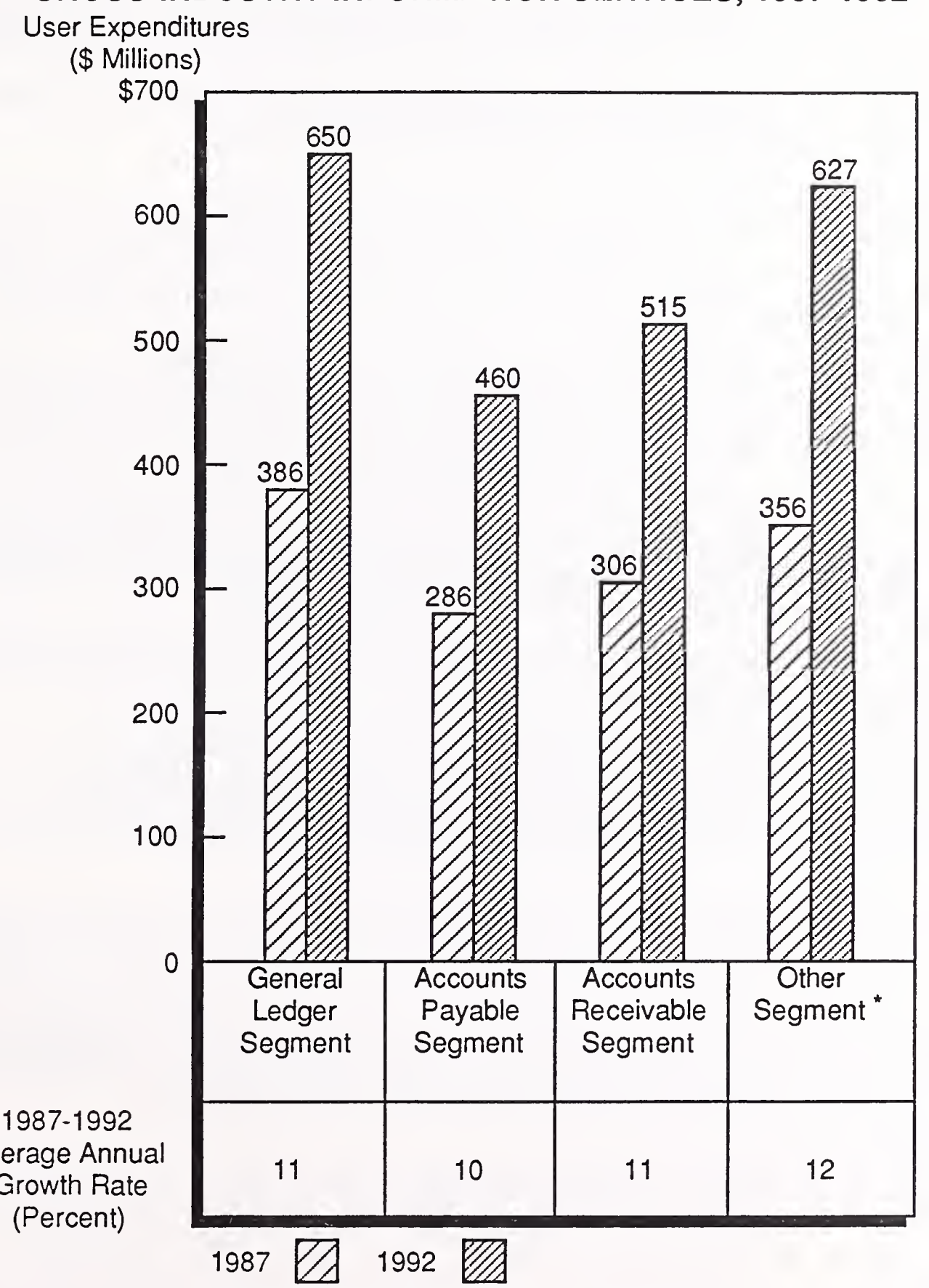
EXHIBIT II-2

APPLICATION SOFTWARE
ACCOUNTING SECTOR FORECAST
CROSS-INDUSTRY INFORMATION SERVICES, 1987-1992



*Billing, job costing, fixed asset management, management reporting, inventory.

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ers in service businesses that are not heavily computerized, such as florists, gasoline service stations, automobile repair shops, shoe repair shops, and barbershops.

- Industry associations' accounting may be performed through an on-line accounting service to reduce the need for a full in-house computer staff.

Key suppliers of accounting processing services include GEISCO, ADP, IBM, McAuto, and Dun & Bradstreet.

C

Software Products

The two fastest growing accounting-based information services, microcomputer software and mainframe/minicomputer software, will grow over the next five years at 15% and 10% annually, respectively.

Many industries are concurrently upgrading to hardware with more main memory and increased disk storage capacity and to "next generation" software. Batch-based accounting software is slowly converting to on-line software. The retail and wholesale distribution industry, some public utilities, hospitals of all sizes, banking and finance, state and local governments, process and discrete manufacturing, higher education institutions, insurance, and the highly competitive transportation industry are leading the conversion of accounting software.

Customers buy accounting software for one or more of the following reasons:

- To produce reports with management information.
- To reduce errors now found with a manual approach.
- To solve specific problems such as processing invoices or needing an up-to-date inventory position.

Microcomputer-based accounting software is catching on in small businesses. Interestingly, INPUT has identified two separate "camps" for accounting software—one favors easy-to-use software while the other prefers full-featured software with extensive report generation capability. Due to the need for more specific information in a preferred format, about 45% of the easy-to-use software group will convert to the more feature-oriented software within two to three years.

Software vendors must select which channel(s) to use for distributing their products; often, the right choice will "make" the product, while the wrong choice will lead to bankruptcy. Besides direct sales, vendors can sell through CPAs or alternative channels such as trade associations. Trade associations are the number-one accounting and application software distribution channel for funeral homes and dental practices.

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D

Turnkey Systems

User expenditures for the accounting portion of industry-specific turnkey systems will grow at 4% annually from $414 million in 1987 to $514 million in 1992.

Value-Added Resellers (VARs) integrate one manufacturer's hardware with an operating system and application software, then sell the package to a particular vertical market. Training and follow-on customer support are important components of the sale. Since sales by VARs to vertical markets have increased slowly but steadily, it follows that the accounting portion of these sales would rise. Target industries for turnkey systems include: process and discrete manufacturing, state and local governments, medical, and banking and finance.

However, accounting revenues are representing a smaller portion of a total industry-specific turnkey application. Smart VARs are adding value (and, hence, can justify charging a higher price) through tailored application software. For the past five years, value-added microcomputer resellers have used a stable accounting product, "Solomon III," as the foundation for their application-specific software.

E

General Ledger

General ledger (GL) software provides an organization with the capability to generate a balance sheet and income statement, do journal processing, and maintain the budget.

Since GL is the foundation for accounting software, the demand for GL software drives purchases of other accounting software packages.

The $386 million market in 1987 for general ledger software is divided such that 79% is for mainframe/minicomputer software and 21% for microcomputer-based GL software.

Large for-profit organizations are using funds accounting to better reflect the cash position of the organization at any given time.

F

Accounts Payable

Accounts payable (AP) software provides for voucher processing, cash disbursements (including preparation of checks), controls, and analysis.

The $286 million accounts payable software market in 1987 is split 84% for mainframe/minicomputer software and 16% for microcomputer software.

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G

Accounts Receivable

Accounts receivable (AR) software tracks vendors invoices, warehouse receipt information, and purchase orders, then matches all three prior to payment.

While all organizations may not want to scrupulously pay their bills, they certainly want to track what monies are owed to them. As a result, accounts receivable software sales slightly exceed those of AP software.

The $306 million accounts receivable software market in 1987 is divided 81% for mainframes/minicomputers and 29% for microcomputers.

H

Other Accounting Software

Other accounting software includes:

- Fixed-asset management.
- International accounting.
- Foreign currency monitoring.
- Order entry.
- Job costing.
- Management reporting.
- Inventory management.

In 1987, the other accounting software segment represented $356 million and will grow 12% annually through 1992 to $627 million, representing the fastest growing segment within the accounting software sector.

Since improvements in fixed-asset management and inventory control have good paybacks, these software categories will spur the demand for other accounting software. In addition, changes in international accounting will create demand for this category of software.

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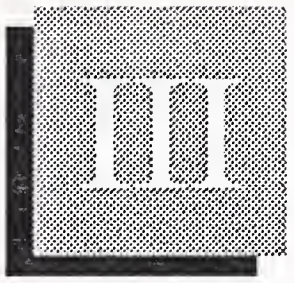
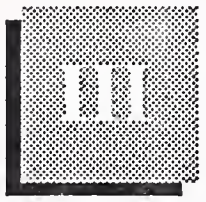


Competitive Developments



Competitive Developments

A

Introduction

The accounting software market can be characterized by the following statements (see Exhibit III-1 and III-2):

- The mainframe software segment contains a small number of large vendors and less than one dozen medium-size vendors. Sales leaders in this segment include MSA, McCormack & Dodge, Computer Associates International, Cullinet, and Data Design Associates.

- The minicomputer software segment is dominated by a few medium-size vendors; segment sales leaders include American Software, ROSSDATA, and Global Software.

- The microcomputer software segment includes fewer than six large firms and nearly one hundred small firms. Computer Associates International (through its San Jose, CA-based subsidiary, formerly called Sorcim), Open Systems, Inc. (now a subsidiary of San Jose-based Convergent, Inc.), Concord Management Systems, and MCBA are the leaders in microcomputer accounting sales.

B

Vendor Profiles

1. Management Science America (MSA) (3445 Peachtree Road, N.E., Atlanta, GA 30326-1276)

a. Products/Services

MSA, founded in 1963, develops, markets, and supports a range of application software packages for use on medium- to large-scale mainframes. Applications include logistics, finance, and human resources.

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EXHIBIT III-1

VENDOR: SOFTWARE PLATFORM ANALYSIS

HARDWARE CATEGORY	LEADING ACCOUNTING SOFTWARE VENDORS
IBM Mainframe	MSA (Atlanta, GA); McCormack & Dodge (Natick, MA); CAI/UCCEL (Westbury, NY); Data Design Associates (Sunnyvale, CA)
IBM Minicomputer (53X, 434X)	American Management Systems (Arlington, VA); System Software Associates (Chicago, IL); Global Software (Raleigh, NC); Eastern Systems Management (Lancaster, PA)
IBM Microcomputer	TLB Inc. (Malvern, PA); Open Systems Inc. (Minneapolis, MN); Computer Associates (Sorcim; San Jose, CA); MCBA (Glendale, CA); CYMA/McGraw Hill
DEC Minicomputer	MCBA (Glendale, CA); Ross Data (Palo Alto, CA); Alpine Data Systems; Collier-Jackson (Tampa, FL); Computer Associates International (McLean, VA)
Apple Microcomputer	Peachtree Software (Atlanta, GA); State-of-the-Art Inc. (Costa Mesa, CA); Focus Software Corporation (Bloomington, MN); Great Plains Software (Fargo, ND)

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EXHIBIT III-2

VENDOR: SOFTWARE REVENUE ANALYSIS

VENDOR	$ (Millions)	
	MAINFRAME/ MINI SOFTWARE	MICRO SOFTWARE
MSA	95.0	-
McCormack & Dodge	40.0	-
Global Software	34.5	-
Computer Associates	27.5	6.5
Cullinet Software	16.2	-
Open Systems	-	12.0
Data Design Associates	10.8	-
MCBA	9.3	3.2
Ross Data Corporation	6.0	-
CYMA/McGraw Hill	-	5.5
Concord Management Systems	-	4.0
Total	239.3	31.2

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b. Markets Served

MSA serves cross-industry markets with its accounting, logistics, and financial software and serves health care providers, higher education institutions, state and local governments, distributors, and insurance firms with industry-specific software.

c. Company Strategy

- Further penetrate vertical markets through acquisition of vendors with high market share.
- Increase the functionality of existing software through expert-systems enhancements.
- Continue to write software for a wide array of hardware platforms.
- Increase its non-U.S. business.
- Increase the revenue derived from software support/software maintenance agreements.

d. Recent Activities

MSA acquired the following products or companies to increase its presence in targeted vertical markets:

- Licensed the Marketing/Clinical/Financial Information System developed by Rush- Presbyterian-St. Luke's Medical Center in Chicago, IL.

- Acquired Comserv Corporation (Minneapolis, MN) from Control Data Corporation for the Company's MRP II software products.

- Acquired Information Associates (Rochester, NY), which develops and markets software to the higher education market.

- Acquired RTS Limited (Dublin, Ireland) for its manufacturing and financial software for the IBM System/36 and System/38 minicomputers.

2. McCormack & Dodge Corporation (Subsidiary of The Dun & Bradstreet Corporation, New York) (1225 Worchester Road, Natick, MA 01760)

a. Products/Services

Key products and services include such financial software as general ledger, accounts payable, and accounts receivable.

McCormack & Dodge (M&D) software runs on IBM mainframes, IBM System/3X minicomputers, Hewlett-Packard 3000 minicomputers, and Digital Equipment Corporation VAX minicomputers.

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b. Markets Served

M&D's accounting and financial software is a cross-industry product; its manufacturing software is targeted to the discrete and process manufacturing markets.

c. Company Strategy

- Complete development of an on-line DEC-to-IBM interface for accounting software products, thus confirming M&D's commitment to DEC VAX and IBM mainframe system environments.

- Maintain its commitment to offer materiel management software that complies fully with Department of Defense contract requirements.

- Offer financial and manufacturing software linked to more relational data base management software products.

d. Recent Activities

In 4Q 1987, company management expended considerable effort to dispel the notion that M&D was for sale, following Dun & Bradstreet's sale of its Nomad software subsidiary.

M&D also advised users of its software for Hewlett-Packard minicomputers of its decision to sell this line to another company. No buyer has been found.

M&D will develop a DEC VAX version of its successful Millennium: SDT development Environment software, now running on IBM mainframes.

3. Computer Associates International, Inc. (711 Stewart Avenue; Garden City, NY 11530-4787)

a. Products/Services

Computer Associates International (CAI) markets more than one hundred software products developed for IBM mainframe operating systems, graphics products for use in business and scientific applications, and microcomputer software for project and resource management, spreadsheet, word processing, data base management, and accounting applications.

Accounting-related products include:

- Masterpiece, financial software for IBM mainframes, DEC VAX minicomputers, Wang VS minicomputers, Hewlett-Packard 3000, and

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Unisys (Sperry) mainframes. These products were acquired in 1986 through the purchase of General Electric Company's Software International Corporation subsidiary.

- EasyBusiness financial accounting software for microcomputers. This product line was obtained as a result of the acquisition of Sorcim (San Jose, CA) and the subsequent merger with Information Unlimited Software (IUS, San Jose, CA) in May 1984.

b. Markets Served

CAI's accounting and financial software serves a variety of markets. The company's literature indicates that more than 80% of Fortune 500 companies use unspecified CAI software.

c. Company Strategy

- Growth through acquisition.
- Offer more data center management products.
- Trim the number of non-data-center/non-system-software product lines or hardware platforms supported.

d. Recent Activities

Acquisitions play a major role in CAI's growth. Key mergers/acquisitions over the past few years include:

- Merged with UCCEL Corporation (Dallas, TX) in August, 1987.
- Acquired L & L Software (McLean, VA), a supplier of job costing accounting software for government contractors and selected commercial environments in May, 1987.
- Acquired BPI Systems, Inc. (Austin, TX) in April, 1987.
- Acquired Software International Corporation (Andover, MA) from General Electric Company in December, 1986.
- Acquired Integrated Software Systems Corporation (ISSCO, San Diego, CA) also in December, 1986.
- Acquired Sorcim Corporation (San Jose, CA) in May, 1984.

CAI made the following recent product announcements:

- Added accounts payable and accounts receivable to the existing general ledger software for the IBM System/38 under its Masterpiece product label.

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- Announced a DEC VAX version of its Masterpiece general ledger accounting software at the Annual Users Group meeting in March, 1987.

4. Cullinet Software, Inc. (400 Blue Hill Drive, Westwood, MA 02090)

a. Products/Services

Cullinet Software offers a wide array of products, which include: Data base management, information center management, and integrated application software for manufacturing, finance, banking, and human resources.

Within the accounting area, the Cullinet Financial System offers on-line accounting and financial reporting capabilities.

b. Markets Served

Since accounting is a cross-industry application, Cullinet sells its Financial System to a variety of markets.

c. Company Strategy

- Continue penetrating the banking and finance vertical market.
- Develop specific applications based on its relational database product.
- Develop software to link mainframes, minicomputers, and microcomputers through an integrated product architecture.
- Develop software for the DEC VAX departmental minicomputer.

d. Recent Activities

Cullinet acquired a number of companies in the past three years:

- In 1984, it acquired Bob White Computing & Software (BWCS, Chicago, IL) for BWCS' application software for the banking industry.

- In 1984, Cullinet acquired the rights to market InSci IDMS-based payroll/personnel software and acquired outright IDMS-based personnel/payroll/accounts receivable packages.

- In June, 1986, Cullinet acquired an on-line international general ledger system, designed for use by multinational corporations, from an undisclosed software developer.

- In August, 1986, Cullinet purchased Computer Solutions, Inc. (Grand Rapids, MI), which specializes in software and consulting to repetitive manufacturing industries.

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- The company acquired, in March, 1987, a fixed-asset management system from Computer Associates International.

5. Open Systems, Inc. (Subsidiary of Convergent, Inc., San Jose, CA) (6477 City West Parkway, Minneapolis, MN 55344)

a. Products/Services

Open Systems, Inc. (OSI) develops, markets, and supports a full range of accounting and financial software, including: Inventory, sales order processing, purchase order processing, ledger, payroll, and fixed-asset management.

OSI software runs on IBM PCs and compatibles and Apple Macintosh microcomputers.

b. Markets Served

As a cross-industry application, accounting software is sold into all vertical markets.

c. Company Strategy

- Concentrate on IBM and Apple Macintosh versions of software.
- Develop and continually upgrade network versions.
- Strengthen distribution arrangements through direct deals with large retail chains such as Businessland or ComputerLand.

d. Recent Activities

OSI, previously owned by UCCEL Corporation (Dallas, TX) was sold to Convergent, Inc. (San Jose, CA) in late 1986.

6. CYMA/McGraw-Hill (1221 Avenue of the Americas, New York, NY 10020)

a. Products/Services

CYMA/McGraw Hill develops, markets, and supports accounting software for small businesses.

The company's software runs on a variety of microcomputers under the CP/M, MP/M, MS-DOS or XENIX operating systems.

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b. Markets Served

While the company's cross-industry products serve many markets, its primary targets are doctors, lawyers, construction, and public accounting.

c. Company Strategy

- Develop network versions of accounting software.
- Increase market presence through more distribution agreements.

7. Data Design Associates (1279 Oakmead Parkway, Sunnyvale, CA 94086)

a. Products/Services

Data Design Associates' (DDA) only products are software for fixed-asset accounting, accounts payable, accounts receivable, general ledger, purchase control, and capital project management.

DDA's products run mainly in batch mode on mainframes and large minicomputers made by IBM, Unisys (Burroughs and Univac), Hewlett-Packard, Honeywell, DEC, Data General, NCR, Prime, and Wang. On-line options are available for IBM and Hewlett-Packard hardware.

b. Markets Served

Data Design's products are cross-industry applications targeted to large, multilocation organizations, primarily in the manufacturing, banking and finance, retail distribution, and transportation industries.

c. Company Strategy

- Increase non-U.S. market presence.
- Maintain strategy of delivering bug-free, high-quality software.
- Develop more, then merge the now-limited microcomputer-based accounting software with mainframe-oriented products.

8. ROSSDATA Corporation (1860 Embarcadero Road, Palo Alto, CA 94303)

a. Products/Services

ROSSDATA, through its Ross Systems Inc. subsidiary, developed and supports MAPS (Management Accounting and Planning Software), which runs on Digital Equipment Corporation VAX minicomputers.

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b. Markets Served

As a developer and marketer of cross-industry application software, ROSSDATA serves all markets.

c. Company Strategy

ROSSDATA's corporate goal is to become the number-one supplier of accounting software for the DEC VAX superminicomputer. To do so will require more international sales and continued product enhancement, all guided by increased attention to marketing issues.

d. Recent Activities

ROSSDATA Corporation was formed in November, 1986 through a merger of Ross Systems, Inc. (Palo Alto, CA) and Virtual Microsystems (Berkeley, CA), a supplier of network products for the DEC VAX operating environment.

9. Global Software, Inc. (Subsidiary of the Hathaway Corporation) (1009 Spring Forest Road, Raleigh, NC 27609)

a. Products/Services

Global Software offers a full line of accounting and financial reporting software for IBM 43XX and 30XX mainframe computers and IBM System/3X minicomputers.

b. Markets Served

Global's customers come from all industries; however, a major share come from manufacturing, healthcare, distribution, utilities, and transportation markets.

c. Company Strategy

The company wishes to incorporate advanced product features such as micro-mainframe links, network support, and fourth-generation reporting capabilities, while improving documentation and customer support.

d. Recent Activities

Global Software purchased the commercial application software division of UCCEL Corporation (Dallas, TX) in mid-1986.

Product enhancements include: Tax Planning & Compliance System, on-line report generator, an upgraded version of its cost control system, an

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on-line credit and accounts receivable management software package acquired through the UCCEL acquisition, a new fixed-asset system, and purchase order and accounts payable systems.

10. MCBA, Inc. (425 West Broadway Avenue, Glendale, CA 91204)

a. Products/Services

MCBA, Inc., established in 1974, originally developed and marketed accounting software for minicomputers. The company now markets general ledger, accounts payable, accounts receivable, inventory management, job costing, labor performance, MRP, payroll, purchase order and receiving, sales history, shop floor control, and standard product costing software for microcomputers running PC-DOS, MS-DOS, UNIX (including System V), XENIX, or RM/COS (Ryan McFarland) operating systems. MCBA software also runs on the following minicomputers: AT&T 3B, Hewlett-Packard 3000, DEC PDP or VAX, Wang VS, or Texas Instruments 990 or TI Business Systems.

b. Markets Served

MCBA provides accounting, distribution, and manufacturing application software primarily for microcomputers and, to a lesser extent, for minicomputers.

c. Company Strategy

- Continue to market microcomputer accounting software through its 1,500-member distribution network.
- Develop accounting software for more hardware platforms.
- Do direct sales of its full-line accounting and manufacturing software for DEC VAX minicomputer.
- Increase education and training for its products in order to remain competitive.

d. Recent Activities

MCBA announced a shop floor control module for the DEC VAX. The module is targeted at companies with sales in the $5 million to $50 million range.

In the spring of 1987, Honeywell Bull and UNISYS agreed to market MCBA software for their systems.

MCBA announced its accounting and distribution software for the AT&T 3B family of computers in November, 1986.

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In June, 1986, MCBA released MRP software written in RM/COBOL under the XENIX operating system for the IBM PC/AT and compatibles.

C

Mergers, Acquisitions, Divestitures

The largest firms have actively pursued the merger/acquisition route to growth. MSA acquired the following products or companies to increase its presence in targeted vertical markets:

- Licensed the Marketing/Clinical/Financial Information System developed by Rush-Presbyterian-St. Luke's Medical Center in Chicago, IL.
- Acquired Comserv Corporation (Minneapolis, MN) from Control Data Corporation.
- Acquired Information Associates (Rochester, NY).
- Acquired RTS Limited (Dublin, Ireland).

Acquisitions play a major role in Computer Associates International (CAI) growth. Key mergers/acquisitions over the past few years include:

- Merged with UCCEL Corporation (Dallas, TX).
- Acquired L & L Software (McLean, VA).
- BPI Systems, Inc. (Austin, TX).
- Software International Corporation (Andover, MA) from General Electric Company.
- Integrated Software Systems Corporation (ISSCO, San Diego, CA).
- Sorcim Corporation (San Jose, CA).

Cullinet acquired a number of companies in the past three years:

- In 1984, it acquired Bob White Computing & Software (BWCS, Chicago, IL).
- In 1984, Cullinet acquired the rights to market InSci IDMS-based payroll/personnel software and acquired outright IDMS-based personnel/payroll/accounts receivable packages.
- In August, 1986, Cullinet purchased Computer Solutions, Inc. (Grand Rapids, MI)
- The company acquired a fixed-asset management system from Computer Associates International.

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D

Firms Entering/ Exiting the Market

In June, 1983, ASK Computer Systems purchased Software Dimensions (Folsom, CA), a developer of accounting software for IBM, Apple, and CP/M-based microcomputers. Software Dimensions was renamed ASK Micro Inc., which was closed in June, 1984.

Merger and acquisition activity has increased and has changed the names of the players; however, no major firms have entered or exited the accounting software market.

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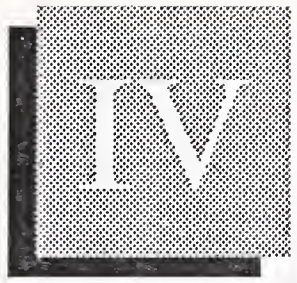
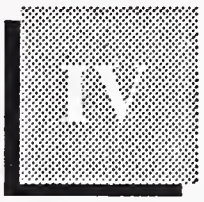


New Opportunities



New Opportunities

INPUT identifies the following opportunities in cross-industry accounting application software:

- Vendors should offer accounting software versions that run on networks of microcomputers.

- More management report generation capabilities, including graphics-based reporting of desired exceptions.

- Linkages of microcomputer-based accounting packages with those running on minicomputers or mainframes.

- Equally important is the ability for DEC VAX minicomputers to share accounting and financial information with IBM mainframes and microcomputers, since these computers will coexist in more user sites.

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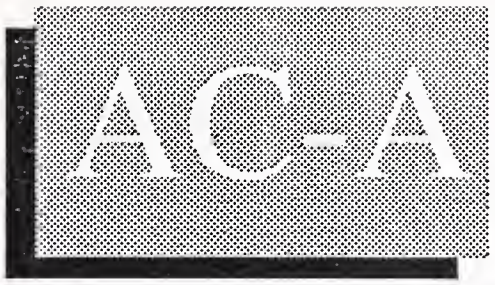

Appendix: Accounting Market Forecast Data Base

AC-A

Appendix: Accounting Market Forecast Data Base

EXHIBIT A-1

ACCOUNTING USER EXPENDITURE FORECAST BY DELIVERY MODE, 1986-1992

SEGMENTATION BY DELIVERY MODE	1986 ($M)	1986-1987 Growth (%)	1987 ($M)	1988 ($M)	1989 ($M)	1990 ($M)	1991 ($M)	1992 ($M)	AAGR 1987-1992 (%)
Remote Computing/ Batch	988	4	1,024	1,048	1,086	1,105	1,132	1,142	2
Application Software									
Mainframe/Mini	883	13	995	1,121	1,248	1,360	1,470	1,567	10
Micro	281	21	339	412	493	576	641	692	15
Total Application Software	1,164	15	1,334	1,533	1,741	1,936	2,111	2,259	11
Turnkey Systems	394	5	414	433	459	485	495	514	4
Cross-Industry Total	2,546	9	2,772	3,014	3,286	3,526	3,738	3,915	7

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About INPUT

INPUT provides planning information, analysis and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, communications, and office products and services.

The company carries out continuous and in-depth research. Working closely with clients on important issues, INPUT's staff members analyze and interpret the research data, then develop recommendations and innovative ideas to meet clients' needs. Clients receive reports, presentations, access to data on which analyses are based, and continuous consulting.

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Formed in 1974, INPUT has become a leading international planning services firm. Clients include over 100 of the world's largest and most technically advanced companies.

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-1 Accounting User Expenditure Forecast by Delivery Mode, 1986-1992 IV-AC-27

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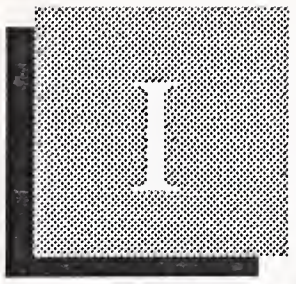
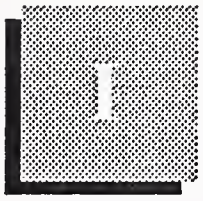


Issues, Trends, and Events



Issues, Trends, and Events

A Introduction

The accounting function is broad, and includes the following specific functions:

- Accounts payable.
- Accounts receivable.
- Billing/Invoicing.
- Costing.
- Fixed assets.
- General ledger.
- Integrated accounting.
- Payroll.
- Other.

Related applications that integrate with accounting modules include:

- Order entry.
- International accounting (currency conversion, value-added taxation, and consolidation).
- Sales lead tracking.
- Purchasing.
- Financial modeling.
- Accounting tailored for specific industries.
- Sales analysis.
- Management reporting.

Financial modeling and sales analysis are discussed in the section on Planning and Analysis. Sales lead tracking, order entry, and sales management reports are covered in the section "Other Cross Industry Sector." Payroll is discussed in the Human Resources cross-industry sector.

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Accounting expenditures represent the sixth largest of 25 major market segments tracked by INPUT. In 1987, end users spent nearly $2.8 billion for cross-industry accounting software and services.

B

"GLAPPAR"

"GLAPPAR" is an accounting shorthand reference for General Ledger, Accounts Payable, Payroll, and Accounts Receivable, the four core accounting applications. Accounting software has traditionally been sold as individual modules for two reasons. First, individual modules can be priced at levels within the approval range of local managers. Accounting software modules for personal computers generally have a maximum price of $400, consistent with the signature authority of local managers. Minicomputer and mainframe computer accounting modules are generally priced within the purchase limit for the division manager. Second, the purchase decision becomes one of buying three or four modules versus one expensive, complicated program. Customers can try one or two modules before committing to the purchase of a new accounting program.

Key trends in "GLAPPAR" accounting software include:

- An evolution from batch to on-line transaction-based software containing "what if" capabilities for budget projections and compliance with government agency reporting requirements.
- The continuing transition from individual modules with multiple-keystroke entries to integrated modules where information is updated in all relevant modules with a single keystroke.
- A general movement from financial-accounting-oriented software to software that not only satisfies financial accounting needs, but also management accounting and management reporting needs.
- More flexibility in accounting software, allowing the developer to tailor portions of the product to meet customer requirements.
- More personal-computer-based accounting software, especially versions operating on networks of PCs.
- A movement from VSAM-based to DBMS-based files permitting better security and layering of data.

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C

Other Accounting Applications

The increase in international business for U.S. companies has increased the need for accounting software to support multinational operations.

The use of fourth generation languages to assemble management reports from data scattered across the system and physically located in separate data bases is an outgrowth of the trend toward integrated corporate information.

D

Events

In 1986, the U.S. Congress and the President approved a major revision to the tax code for individuals and businesses. Software for depreciation, investment tax credit computation, and multinational accounting required modification.

E

Products

New accounting software differs significantly from previous-generation products. The latest accounting products are able to accommodate more files (especially valuable for holding many invoices or accounts receivable), are designed for on-line use, and can easily generate custom reports for management. This new "generation" of products fully utilizes the expanded main memory capacity of the host computer system. Organizations with single-user-based accounting are asking for network versions of accounting software.

As part of a symbiotic relationship, full-featured accounting software helps sell more hardware.

Support for more transactions per second for mainframe/minicomputer software represents another trend in accounting software product features.

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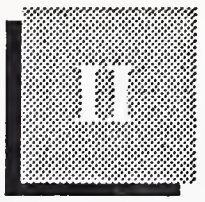
III

Market Forecasts



Market Forecasts

A

Introduction

User expenditures for accounting cross-industry applications will grow 7% annually through 1992, increasing from $2.7 billion to $3.9 billion in 1992. For details, please refer to Exhibits II-1 and II-2.

- Mainframe/minicomputer accounting software will enjoy a relatively high growth of 10% annually from $995 million in 1987 to $1.6 billion in 1992.

- Microcomputer-based accounting will grow fastest, at 15% annually, from $339 million in 1987 to $692 million in 1992.

- Turnkey systems will grow relatively slowly from $414 million in 1987 to $514 million in 1992, an annual growth rate of only 4%. For the "accounting cross-industry" application, turnkey systems refer to the value of the accounting portion of the total price of an industry-specific or application-specific turnkey system.

B

Processing/Network Services

With the plethora of computer-based accounting software, one would not expect much of a market for accounting-oriented remote/batch computing services. In fact, remote/batch computing service-based accounting is a $1.0-billion-a-year business. Why is this so?

- Large national and regional accounting firms offer on-line or batch accounting services for customers as a "lock-in" to that firm's accounting and auditing services.

- Industry associations offer members discounted accounting services at a fee over the basic membership charge.

- Wholesalers are offering accounting services to retailers to maintain a business relationship. Most often, these services are provided to retail-

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EXHIBIT II-1

ACCOUNTING SECTOR FORECAST
CROSS-INDUSTRY INFORMATION SERVICES, 1987-1992

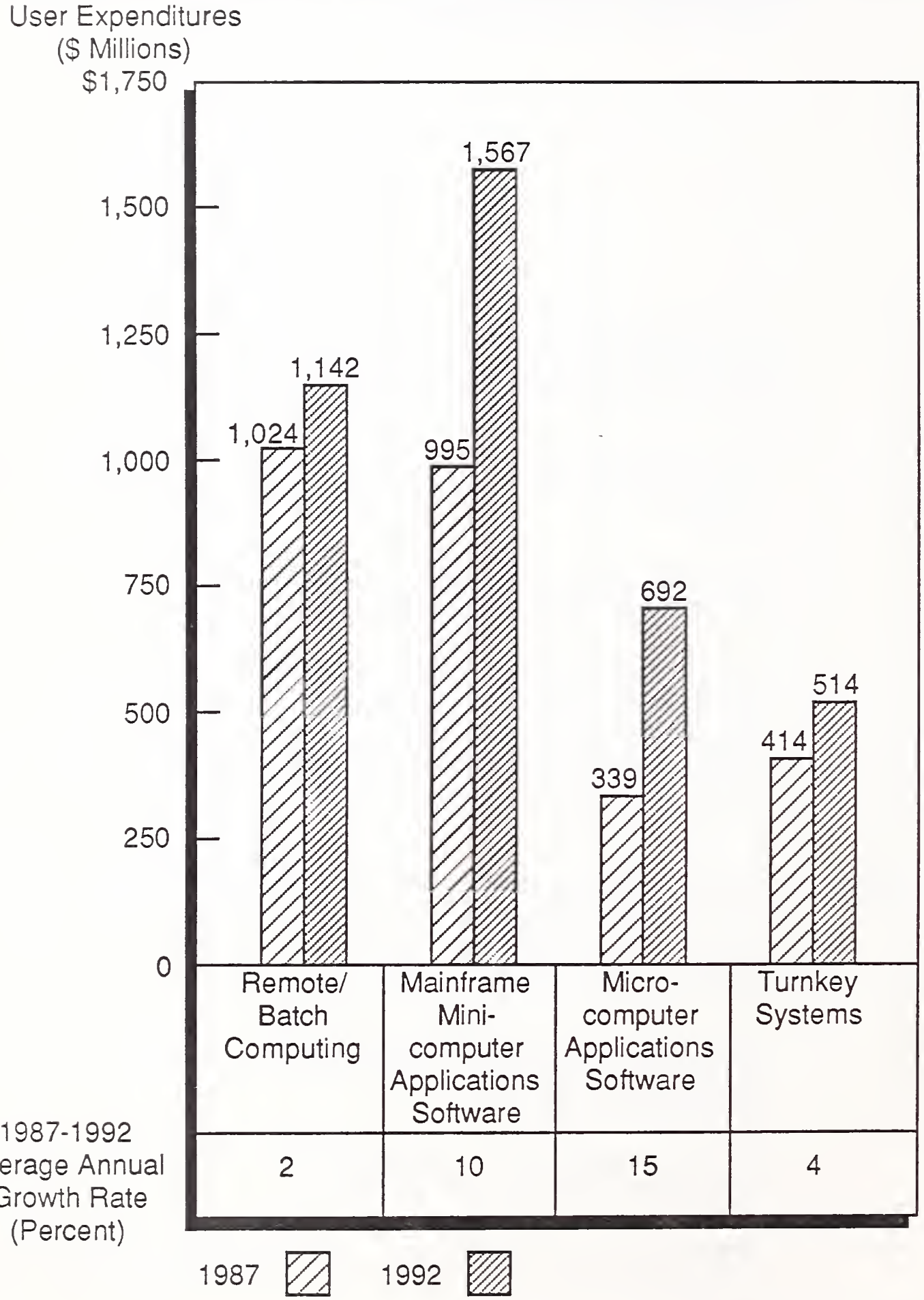

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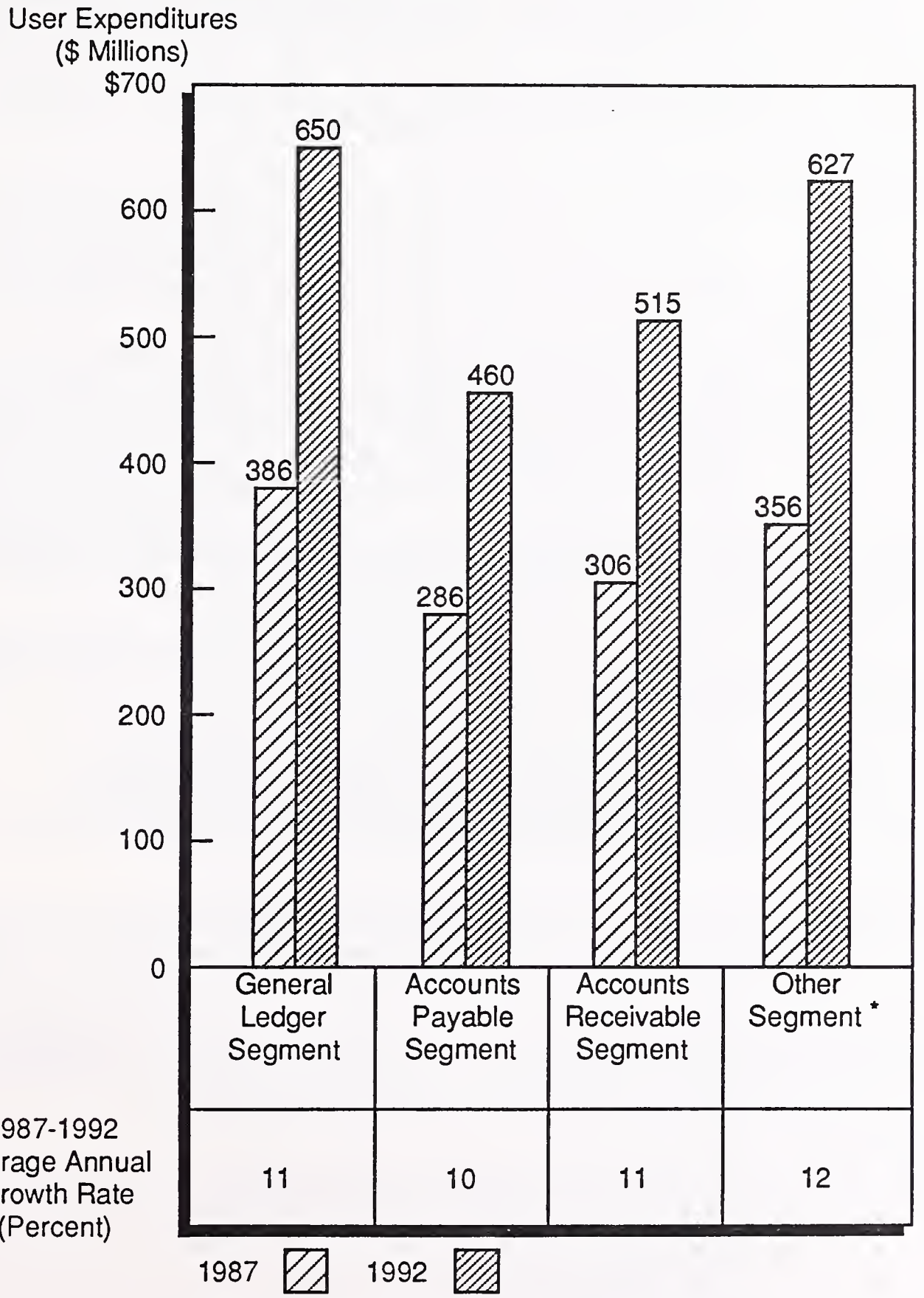
EXHIBIT II-2

APPLICATION SOFTWARE
ACCOUNTING SECTOR FORECAST
CROSS-INDUSTRY INFORMATION SERVICES, 1987-1992



*Billing, job costing, fixed asset management, management reporting, inventory.

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ers in service businesses that are not heavily computerized, such as florists, gasoline service stations, automobile repair shops, shoe repair shops, and barbershops.

- Industry associations' accounting may be performed through an on-line accounting service to reduce the need for a full in-house computer staff.

Key suppliers of accounting processing services include GEISCO, ADP, IBM, McAuto, and Dun & Bradstreet.

C

Software Products

The two fastest growing accounting-based information services, microcomputer software and mainframe/minicomputer software, will grow over the next five years at 15% and 10% annually, respectively.

Many industries are concurrently upgrading to hardware with more main memory and increased disk storage capacity and to "next generation" software. Batch-based accounting software is slowly converting to on-line software. The retail and wholesale distribution industry, some public utilities, hospitals of all sizes, banking and finance, state and local governments, process and discrete manufacturing, higher education institutions, insurance, and the highly competitive transportation industry are leading the conversion of accounting software.

Customers buy accounting software for one or more of the following reasons:

- To produce reports with management information.
- To reduce errors now found with a manual approach.
- To solve specific problems such as processing invoices or needing an up-to-date inventory position.

Microcomputer-based accounting software is catching on in small businesses. Interestingly, INPUT has identified two separate "camps" for accounting software—one favors easy-to-use software while the other prefers full-featured software with extensive report generation capability. Due to the need for more specific information in a preferred format, about 45% of the easy-to-use software group will convert to the more feature-oriented software within two to three years.

Software vendors must select which channel(s) to use for distributing their products; often, the right choice will "make" the product, while the wrong choice will lead to bankruptcy. Besides direct sales, vendors can sell through CPAs or alternative channels such as trade associations. Trade associations are the number-one accounting and application software distribution channel for funeral homes and dental practices.

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D

Turnkey Systems

User expenditures for the accounting portion of industry-specific turnkey systems will grow at 4% annually from $414 million in 1987 to $514 million in 1992.

Value-Added Resellers (VARs) integrate one manufacturer's hardware with an operating system and application software, then sell the package to a particular vertical market. Training and follow-on customer support are important components of the sale. Since sales by VARs to vertical markets have increased slowly but steadily, it follows that the accounting portion of these sales would rise. Target industries for turnkey systems include: process and discrete manufacturing, state and local governments, medical, and banking and finance.

However, accounting revenues are representing a smaller portion of a total industry-specific turnkey application. Smart VARs are adding value (and, hence, can justify charging a higher price) through tailored application software. For the past five years, value-added microcomputer resellers have used a stable accounting product, "Solomon III," as the foundation for their application-specific software.

E

General Ledger

General ledger (GL) software provides an organization with the capability to generate a balance sheet and income statement, do journal processing, and maintain the budget.

Since GL is the foundation for accounting software, the demand for GL software drives purchases of other accounting software packages.

The $386 million market in 1987 for general ledger software is divided such that 79% is for mainframe/minicomputer software and 21% for microcomputer-based GL software.

Large for-profit organizations are using funds accounting to better reflect the cash position of the organization at any given time.

F

Accounts Payable

Accounts payable (AP) software provides for voucher processing, cash disbursements (including preparation of checks), controls, and analysis.

The $286 million accounts payable software market in 1987 is split 84% for mainframe/minicomputer software and 16% for microcomputer software.

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G

Accounts Receivable

Accounts receivable (AR) software tracks vendors invoices, warehouse receipt information, and purchase orders, then matches all three prior to payment.

While all organizations may not want to scrupulously pay their bills, they certainly want to track what monies are owed to them. As a result, accounts receivable software sales slightly exceed those of AP software.

The $306 million accounts receivable software market in 1987 is divided 81% for mainframes/minicomputers and 29% for microcomputers.

H

Other Accounting Software

Other accounting software includes:

- Fixed-asset management.
- International accounting.
- Foreign currency monitoring.
- Order entry.
- Job costing.
- Management reporting.
- Inventory management.

In 1987, the other accounting software segment represented $356 million and will grow 12% annually through 1992 to $627 million, representing the fastest growing segment within the accounting software sector.

Since improvements in fixed-asset management and inventory control have good paybacks, these software categories will spur the demand for other accounting software. In addition, changes in international accounting will create demand for this category of software.

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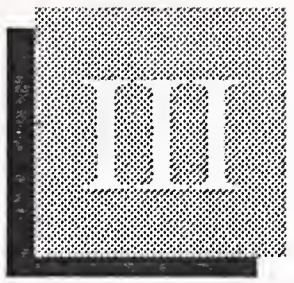
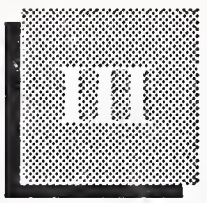


Competitive Developments



Competitive Developments

A Introduction

The accounting software market can be characterized by the following statements (see Exhibit III-1 and III-2):

- The mainframe software segment contains a small number of large vendors and less than one dozen medium-size vendors. Sales leaders in this segment include MSA, McCormack & Dodge, Computer Associates International, Cullinet, and Data Design Associates.

- The minicomputer software segment is dominated by a few medium-size vendors; segment sales leaders include American Software, ROSSDATA, and Global Software.

- The microcomputer software segment includes fewer than six large firms and nearly one hundred small firms. Computer Associates International (through its San Jose, CA-based subsidiary, formerly called Sorcim), Open Systems, Inc. (now a subsidiary of San Jose-based Convergent, Inc.), Concord Management Systems, and MCBA are the leaders in microcomputer accounting sales.

B Vendor Profiles

1. Management Science America (MSA) (3445 Peachtree Road, N.E., Atlanta, GA 30326-1276)

a. Products/Services

MSA, founded in 1963, develops, markets, and supports a range of application software packages for use on medium- to large-scale mainframes. Applications include logistics, finance, and human resources.

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EXHIBIT III-1

VENDOR: SOFTWARE PLATFORM ANALYSIS

HARDWARE CATEGORY	LEADING ACCOUNTING SOFTWARE VENDORS
IBM Mainframe	MSA (Atlanta, GA); McCormack & Dodge (Natick, MA); CAI/UCCEL (Westbury, NY); Data Design Associates (Sunnyvale, CA)
IBM Minicomputer (53X, 434X)	American Management Systems (Arlington, VA); System Software Associates (Chicago, IL); Global Software (Raleigh, NC); Eastern Systems Management (Lancaster, PA)
IBM Microcomputer	TLB Inc. (Malvern, PA); Open Systems Inc. (Minneapolis, MN); Computer Associates (Sorcim; San Jose, CA); MCBA (Glendale, CA); CYMA/McGraw Hill
DEC Minicomputer	MCBA (Glendale, CA); Ross Data (Palo Alto, CA); Alpine Data Systems; Collier-Jackson (Tampa, FL); Computer Associates International (McLean, VA)
Apple Microcomputer	Peachtree Software (Atlanta, GA); State-of-the-Art Inc. (Costa Mesa, CA); Focus Software Corporation (Bloomington, MN); Great Plains Software (Fargo, ND)

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EXHIBIT III-2

VENDOR: SOFTWARE REVENUE ANALYSIS

VENDOR	$ (Millions)	
	MAINFRAME/ MINI SOFTWARE	MICRO SOFTWARE
MSA	95.0	-
McCormack & Dodge	40.0	-
Global Software	34.5	-
Computer Associates	27.5	6.5
Cullinet Software	16.2	-
Open Systems	-	12.0
Data Design Associates	10.8	-
MCBA	9.3	3.2
Ross Data Corporation	6.0	-
CYMA/McGraw Hill	-	5.5
Concord Management Systems	-	4.0
Total	239.3	31.2

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b. Markets Served

MSA serves cross-industry markets with its accounting, logistics, and financial software and serves health care providers, higher education institutions, state and local governments, distributors, and insurance firms with industry-specific software.

c. Company Strategy

- Further penetrate vertical markets through acquisition of vendors with high market share.
- Increase the functionality of existing software through expert-systems enhancements.
- Continue to write software for a wide array of hardware platforms.
- Increase its non-U.S. business.
- Increase the revenue derived from software support/software maintenance agreements.

d. Recent Activities

MSA acquired the following products or companies to increase its presence in targeted vertical markets:

- Licensed the Marketing/Clinical/Financial Information System developed by Rush- Presbyterian-St. Luke's Medical Center in Chicago, IL.

- Acquired Comserv Corporation (Minneapolis, MN) from Control Data Corporation for the Company's MRP II software products.

- Acquired Information Associates (Rochester, NY), which develops and markets software to the higher education market.

- Acquired RTS Limited (Dublin, Ireland) for its manufacturing and financial software for the IBM System/36 and System/38 minicomputers.

2. McCormack & Dodge Corporation (Subsidiary of The Dun & Bradstreet Corporation, New York) (1225 Worchester Road, Natick, MA 01760)

a. Products/Services

Key products and services include such financial software as general ledger, accounts payable, and accounts receivable.

McCormack & Dodge (M&D) software runs on IBM mainframes, IBM System/3X minicomputers, Hewlett-Packard 3000 minicomputers, and Digital Equipment Corporation VAX minicomputers.

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b. Markets Served

M&D's accounting and financial software is a cross-industry product; its manufacturing software is targeted to the discrete and process manufacturing markets.

c. Company Strategy

- Complete development of an on-line DEC-to-IBM interface for accounting software products, thus confirming M&D's commitment to DEC VAX and IBM mainframe system environments.

- Maintain its commitment to offer materiel management software that complies fully with Department of Defense contract requirements.

- Offer financial and manufacturing software linked to more relational data base management software products.

d. Recent Activities

In 4Q 1987, company management expended considerable effort to dispel the notion that M&D was for sale, following Dun & Bradstreet's sale of its Nomad software subsidiary.

M&D also advised users of its software for Hewlett-Packard minicomputers of its decision to sell this line to another company. No buyer has been found.

M&D will develop a DEC VAX version of its successful Millennium: SDT development Environment software, now running on IBM mainframes.

3. Computer Associates International, Inc. (711 Stewart Avenue; Garden City, NY 11530-4787)

a. Products/Services

Computer Associates International (CAI) markets more than one hundred software products developed for IBM mainframe operating systems, graphics products for use in business and scientific applications, and microcomputer software for project and resource management, spreadsheet, word processing, data base management, and accounting applications.

Accounting-related products include:

- Masterpiece, financial software for IBM mainframes, DEC VAX minicomputers, Wang VS minicomputers, Hewlett-Packard 3000, and

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Unisys (Sperry) mainframes. These products were acquired in 1986 through the purchase of General Electric Company's Software International Corporation subsidiary.

- EasyBusiness financial accounting software for microcomputers. This product line was obtained as a result of the acquisition of Sorcim (San Jose, CA) and the subsequent merger with Information Unlimited Software (IUS, San Jose, CA) in May 1984.

b. Markets Served

CAI's accounting and financial software serves a variety of markets. The company's literature indicates that more than 80% of Fortune 500 companies use unspecified CAI software.

c. Company Strategy

- Growth through acquisition.
- Offer more data center management products.
- Trim the number of non-data-center/non-system-software product lines or hardware platforms supported.

d. Recent Activities

Acquisitions play a major role in CAI's growth. Key mergers/acquisitions over the past few years include:

- Merged with UCCEL Corporation (Dallas, TX) in August, 1987.
- Acquired L & L Software (McLean, VA), a supplier of job costing accounting software for government contractors and selected commercial environments in May, 1987.
- Acquired BPI Systems, Inc. (Austin, TX) in April, 1987.
- Acquired Software International Corporation (Andover, MA) from General Electric Company in December, 1986.
- Acquired Integrated Software Systems Corporation (ISSCO, San Diego, CA) also in December, 1986.
- Acquired Sorcim Corporation (San Jose, CA) in May, 1984.

CAI made the following recent product announcements:

- Added accounts payable and accounts receivable to the existing general ledger software for the IBM System/38 under its Masterpiece product label.

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- Announced a DEC VAX version of its Masterpiece general ledger accounting software at the Annual Users Group meeting in March, 1987.

4. Cullinet Software, Inc. (400 Blue Hill Drive, Westwood, MA 02090)

a. Products/Services

Cullinet Software offers a wide array of products, which include: Data base management, information center management, and integrated application software for manufacturing, finance, banking, and human resources.

Within the accounting area, the Cullinet Financial System offers on-line accounting and financial reporting capabilities.

b. Markets Served

Since accounting is a cross-industry application, Cullinet sells its Financial System to a variety of markets.

c. Company Strategy

- Continue penetrating the banking and finance vertical market.
- Develop specific applications based on its relational database product.
- Develop software to link mainframes, minicomputers, and microcomputers through an integrated product architecture.
- Develop software for the DEC VAX departmental minicomputer.

d. Recent Activities

Cullinet acquired a number of companies in the past three years:

- In 1984, it acquired Bob White Computing & Software (BWCS, Chicago, IL) for BWCS' application software for the banking industry.

- In 1984, Cullinet acquired the rights to market InSci IDMS-based payroll/personnel software and acquired outright IDMS-based personnel/payroll/accounts receivable packages.

- In June, 1986, Cullinet acquired an on-line international general ledger system, designed for use by multinational corporations, from an undisclosed software developer.

- In August, 1986, Cullinet purchased Computer Solutions, Inc. (Grand Rapids, MI), which specializes in software and consulting to repetitive manufacturing industries.

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- The company acquired, in March, 1987, a fixed-asset management system from Computer Associates International.

5. Open Systems, Inc. (Subsidiary of Convergent, Inc., San Jose, CA) (6477 City West Parkway, Minneapolis, MN 55344)

a. Products/Services

Open Systems, Inc. (OSI) develops, markets, and supports a full range of accounting and financial software, including: Inventory, sales order processing, purchase order processing, ledger, payroll, and fixed-asset management.

OSI software runs on IBM PCs and compatibles and Apple Macintosh microcomputers.

b. Markets Served

As a cross-industry application, accounting software is sold into all vertical markets.

c. Company Strategy

- Concentrate on IBM and Apple Macintosh versions of software.
- Develop and continually upgrade network versions.
- Strengthen distribution arrangements through direct deals with large retail chains such as Businessland or ComputerLand.

d. Recent Activities

OSI, previously owned by UCCEL Corporation (Dallas, TX) was sold to Convergent, Inc. (San Jose, CA) in late 1986.

6. CYMA/McGraw-Hill (1221 Avenue of the Americas, New York, NY 10020)

a. Products/Services

CYMA/McGraw Hill develops, markets, and supports accounting software for small businesses.

The company's software runs on a variety of microcomputers under the CP/M, MP/M, MS-DOS or XENIX operating systems.

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b. Markets Served

While the company's cross-industry products serve many markets, its primary targets are doctors, lawyers, construction, and public accounting.

c. Company Strategy

- Develop network versions of accounting software.
- Increase market presence through more distribution agreements.

7. Data Design Associates (1279 Oakmead Parkway, Sunnyvale, CA 94086)

a. Products/Services

Data Design Associates' (DDA) only products are software for fixed-asset accounting, accounts payable, accounts receivable, general ledger, purchase control, and capital project management.

DDA's products run mainly in batch mode on mainframes and large minicomputers made by IBM, Unisys (Burroughs and Univac), Hewlett-Packard, Honeywell, DEC, Data General, NCR, Prime, and Wang. On-line options are available for IBM and Hewlett-Packard hardware.

b. Markets Served

Data Design's products are cross-industry applications targeted to large, multilocation organizations, primarily in the manufacturing, banking and finance, retail distribution, and transportation industries.

c. Company Strategy

- Increase non-U.S. market presence.
- Maintain strategy of delivering bug-free, high-quality software.
- Develop more, then merge the now-limited microcomputer-based accounting software with mainframe-oriented products.

8. ROSSDATA Corporation (1860 Embarcadero Road, Palo Alto, CA 94303)

a. Products/Services

ROSSDATA, through its Ross Systems Inc. subsidiary, developed and supports MAPS (Management Accounting and Planning Software), which runs on Digital Equipment Corporation VAX minicomputers.

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b. Markets Served

As a developer and marketer of cross-industry application software, ROSSDATA serves all markets.

c. Company Strategy

ROSSDATA's corporate goal is to become the number-one supplier of accounting software for the DEC VAX superminicomputer. To do so will require more international sales and continued product enhancement, all guided by increased attention to marketing issues.

d. Recent Activities

ROSSDATA Corporation was formed in November, 1986 through a merger of Ross Systems, Inc. (Palo Alto, CA) and Virtual Microsystems (Berkeley, CA), a supplier of network products for the DEC VAX operating environment.

9. Global Software, Inc. (Subsidiary of the Hathaway Corporation) (1009 Spring Forest Road, Raleigh, NC 27609)

a. Products/Services

Global Software offers a full line of accounting and financial reporting software for IBM 43XX and 30XX mainframe computers and IBM System/3X minicomputers.

b. Markets Served

Global's customers come from all industries; however, a major share come from manufacturing, healthcare, distribution, utilities, and transportation markets.

c. Company Strategy

The company wishes to incorporate advanced product features such as micro-mainframe links, network support, and fourth-generation reporting capabilities, while improving documentation and customer support.

d. Recent Activities

Global Software purchased the commercial application software division of UCCEL Corporation (Dallas, TX) in mid-1986.

Product enhancements include: Tax Planning & Compliance System, on-line report generator, an upgraded version of its cost control system, an

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on-line credit and accounts receivable management software package acquired through the UCCEL acquisition, a new fixed-asset system, and purchase order and accounts payable systems.

10. MCBA, Inc.
(425 West Broadway Avenue, Glendale, CA 91204)

a. Products/Services

MCBA, Inc., established in 1974, originally developed and marketed accounting software for minicomputers. The company now markets general ledger, accounts payable, accounts receivable, inventory management, job costing, labor performance, MRP, payroll, purchase order and receiving, sales history, shop floor control, and standard product costing software for microcomputers running PC-DOS, MS-DOS, UNIX (including System V), XENIX, or RM/COS (Ryan McFarland) operating systems. MCBA software also runs on the following minicomputers: AT&T 3B, Hewlett-Packard 3000, DEC PDP or VAX, Wang VS, or Texas Instruments 990 or TI Business Systems.

b. Markets Served

MCBA provides accounting, distribution, and manufacturing application software primarily for microcomputers and, to a lesser extent, for minicomputers.

c. Company Strategy

- Continue to market microcomputer accounting software through its 1,500-member distribution network.
- Develop accounting software for more hardware platforms.
- Do direct sales of its full-line accounting and manufacturing software for DEC VAX minicomputer.
- Increase education and training for its products in order to remain competitive.

d. Recent Activities

MCBA announced a shop floor control module for the DEC VAX. The module is targeted at companies with sales in the $5 million to $50 million range.

In the spring of 1987, Honeywell Bull and UNISYS agreed to market MCBA software for their systems.

MCBA announced its accounting and distribution software for the AT&T 3B family of computers in November, 1986.

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In June, 1986, MCBA released MRP software written in RM/COBOL under the XENIX operating system for the IBM PC/AT and compatibles.

C

Mergers, Acquisitions, Divestitures

The largest firms have actively pursued the merger/acquisition route to growth. MSA acquired the following products or companies to increase its presence in targeted vertical markets:

- Licensed the Marketing/Clinical/Financial Information System developed by Rush-Presbyterian-St. Luke's Medical Center in Chicago, IL.
- Acquired Comserv Corporation (Minneapolis, MN) from Control Data Corporation.
- Acquired Information Associates (Rochester, NY).
- Acquired RTS Limited (Dublin, Ireland).

Acquisitions play a major role in Computer Associates International (CAI) growth. Key mergers/acquisitions over the past few years include:

- Merged with UCCEL Corporation (Dallas, TX).
- Acquired L & L Software (McLean, VA).
- BPI Systems, Inc. (Austin, TX).
- Software International Corporation (Andover, MA) from General Electric Company.
- Integrated Software Systems Corporation (ISSCO, San Diego, CA).
- Sorcim Corporation (San Jose, CA).

Cullinet acquired a number of companies in the past three years:

- In 1984, it acquired Bob White Computing & Software (BWCS, Chicago, IL).
- In 1984, Cullinet acquired the rights to market InSci IDMS-based payroll/personnel software and acquired outright IDMS-based personnel/payroll/accounts receivable packages.
- In August, 1986, Cullinet purchased Computer Solutions, Inc. (Grand Rapids, MI)
- The company acquired a fixed-asset management system from Computer Associates International.

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D

Firms Entering/ Exiting the Market

In June, 1983, ASK Computer Systems purchased Software Dimensions (Folsom, CA), a developer of accounting software for IBM, Apple, and CP/M-based microcomputers. Software Dimensions was renamed ASK Micro Inc., which was closed in June, 1984.

Merger and acquisition activity has increased and has changed the names of the players; however, no major firms have entered or exited the accounting software market.

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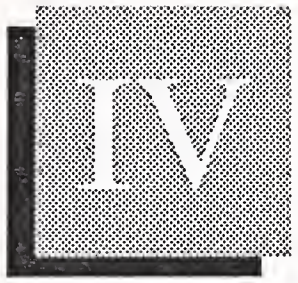
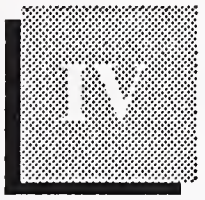


New Opportunities



New Opportunities

INPUT identifies the following opportunities in cross-industry accounting application software:

- Vendors should offer accounting software versions that run on networks of microcomputers.
- More management report generation capabilities, including graphics-based reporting of desired exceptions.
- Linkages of microcomputer-based accounting packages with those running on minicomputers or mainframes.
- Equally important is the ability for DEC VAX minicomputers to share accounting and financial information with IBM mainframes and microcomputers, since these computers will coexist in more user sites.

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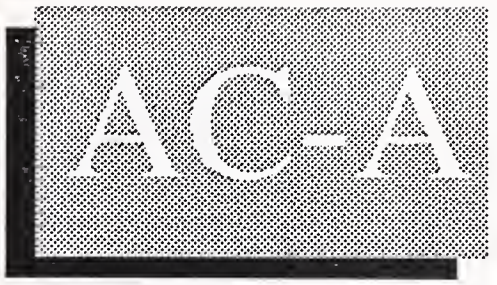

Appendix: Accounting Market Forecast Data Base

AC-A

Appendix: Accounting Market Forecast Data Base

EXHIBIT A-1

ACCOUNTING USER EXPENDITURE FORECAST BY DELIVERY MODE, 1986-1992

SEGMENTATION BY DELIVERY MODE	1986 ($M)	1986-1987 Growth (%)	1987 ($M)	1988 ($M)	1989 ($M)	1990 ($M)	1991 ($M)	1992 ($M)	AAGR 1987-1992 (%)
Remote Computing/ Batch	988	4	1,024	1,048	1,086	1,105	1,132	1,142	2
Application Software									
Mainframe/Mini	883	13	995	1,121	1,248	1,360	1,470	1,567	10
Micro	281	21	339	412	493	576	641	692	15
Total Application Software	1,164	15	1,334	1,533	1,741	1,936	2,111	2,259	11
Turnkey Systems	394	5	414	433	459	485	495	514	4
Cross-Industry Total	2,546	9	2,772	3,014	3,286	3,526	3,738	3,915	7

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INPUT provides planning information, analysis and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, communications, and office products and services.

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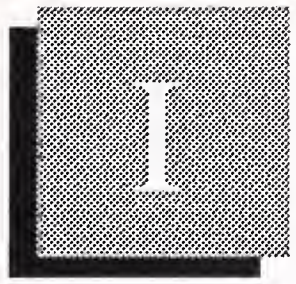

Issues and Trends

I

Issues and Trends

A

Introduction

INPUT analyzes education and training both as a vertical industry and as a cross-industry professional service.

As shown in Exhibit I-1, the cross-industry education and training services that IS vendors sell can be added together for all markets but education.

When education and training products such as a training course available on remote processing or on a diskette to load into a PC are sold by an IS vendor to the education market for use in schools, they are considered by INPUT to be part of the vertical market of education.

As later exhibits illustrate, the market for IS cross-industry education and training will include:

- Processing.
- Applications software for micro, mini, or mainframe computers.
- Turnkey systems.
- Professional services.

For the purposes of this report, "education and training professional services" refers only to training on computers and computing and management courses for IS professionals. Other modes – such as software and processing services – include training relating to other subjects in addition to computers and computing.

Education that occurs in educational institutions (i.e., schools) is forecast in the Education Industry-Specific segment, found in the report *U.S. Information Services Industry-Specific Markets, 1987-1992*. This report covers only the cross-industry segment of education and training market.

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EXHIBIT I-1

I.S. CROSS-INDUSTRY EDUCATION AND TRAINING

CROSS-INDUSTRY APPLICATION	SELECTED VERTICAL MARKETS			
	Banking/ Finance	Insurance	Manufacturing	Education
General Accounting	X	X	X	X
Human Resources	X	X	X	X
Education and Training	X	X	X	-

"X" shows the usage that is part of a cross-industry total.

IS education and training can be examined in terms of the following services:

- Classroom or live instruction,
- Multimedia and interactive video (IVI),
- Computer-based training (CBT), which includes computer-assisted instruction (CAI) and computer-managed instruction (CMI).
- Self study

Both white and blue collar workers will be exposed to several types of training from IS vendors. One type of training will concern using computers for specific job functions. The second type of training will involve the use of computers to train workers in procedures, techniques, and new systems.

- Training programs on the operation of complex financial and manufacturing systems are now being provided on computers.

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- Complex new procedures in factory automation will be taught to workers through simulation and other computer-based techniques.

End-user courseware is sold in two forms – packaged and custom. Packaged courseware has become very popular due to the cost-effectiveness of its delivery.

The major issues in this market are discussed below by mode of delivery.

B

Classroom or Live Instruction

Live classroom training comprises approximately 70% of the training market. Of the classroom training mode, about 60% is off-site training as opposed to 40% for on-site training.

- Live training or lecturing is the easiest mode for a small firm to use when entering the business.

- When a new technical area such as network integration or a functional or management subject such as merchant banking must be addressed, the easiest method for gaining knowledge may be to hire a consultant to provide live training.

Live or classroom training may make use of slides, overheads, and other media to support instruction. Several lecturers can divide the material presented in a lecture and offer contrasting styles to maintain interest.

There has been a tendency for some vendors to replace live training with CBT or IVI training during the last few years in order to reduce costs associated with travel and other expenses.

- Many corporations have shown reawakened interest in live training during this period since a constant diet of CBT or IVI courses can be unpopular.

- Live teachers can also provide much more feedback on personnel and recommend meaningful changes in education.

- Live instruction has also become more popular than CBT and IVI in teaching interpersonal management skills where group interaction is an important part of the course.

There is a great deal of competition among vendors of live instruction. Barriers are low, and many smaller companies spring up that specialize in a single course or a specific topic area.

INPUT predicts that companies who have practically eliminated live instruction will reintroduce it in their services.

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C

Self Study

Self study comprises approximately 15% of the education and training market. Of this, about one-third is captive study on product-specific programs and two-thirds is generic instruction.

Self study constitutes one of the necessary adjuncts to training for busy executives and technical people.

A number of new techniques for self study have emerged including cassettes for the busy executive to play on a car audio system and material developed for presentation on VCRs and home computers.

D

Multimedia and Interactive Video (IVI)

This area has expanded during the last five years. Basically, it uses video instruction and adds an interactive phase to it. Respondents are questioned on information and a tailored response to their answers is given on video and possibly audio.

- Many of the basic ideas that are being used in IVI have been taken from experiments in childhood education: Sounds that keep a student attentive or a response that might embarrass students who have not been paying attention keep the session moving and the student attentive.
- Interactive education with pictures and sound has been found to be a highly successful means of imparting knowledge.

This form of training has been used successfully in the areas of sales and management as well as technical training.

E

Computer-Based Training (CBT)

The use of CBT in education and training is expanding. INPUT's definition of this segment includes:

- In the education and training segment, all methods for training users how to use computer systems, as well as using computers (CBT) to train workers in any subject, including non-computer topics.
- Computer-based training refering to any training activity in which computers are used to either a) present material that is to be learned, b) provide practice activities or tests on material presented through other media, or c) manage the administration of courses using computers.
- For the purposes of our forecasts, CBT includes CAI (computer-assisted instruction) and CMI (computer-managed instruction).

This is a large growth area for vendors who use computers to deliver or aid in the delivery of instruction for technical and semi-technical skills.

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Retention of course material has been shown to be high when students actively take part in the instruction as is done in the interactive video area.

In the early 1980s, CBT courses had a very sparse existence on mainframes, minicomputers, or microcomputers. This has been changing over the last few years as major suppliers, software companies, and computer systems manufacturers are all getting on the CBT bandwagon and offering courses to end users.

CBT is being used to teach the following areas:

- Information systems skills.
- Technical skills.
- Software applications.
- Management capabilities, such as:
  - Project management.
  - Resource allocation.
  - Personnel dynamics.
  - Human resources.

The future uses of CBT cover a wide range of topics, and CBT will experience increases in the areas of :

- Training end users in systems and procedures, e.g., tellers, clerical workers, mechanics, and repair people.

- Users requiring technical training.

CBT systems can be used to present text, graphics, practice activities, simulations, and questions and to provide feedback.

The advantages of CBT include:

- Reduced costs of providing instruction.
- Increased flexibility in presenting instructional material.
- Convenience.
- Uniformity.

CBT courses are normally distributed to users by terminals connected to a mainframe (or minicomputer) at a vendor's location or from an in-house site or by standalone microcomputers.

Microcomputer applications software has been a fast growth area in this sector. Factors stimulating the market include the declining cost of both computer systems and software, the availability of microcomputers in large numbers, and the tremendous need for hands-on computer training.

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Due to the increased availability of presentation systems, ASI, a leading education training vendor, anticipates delivering courses via telecommunications in the near future. They expect to download courses from their mainframe to customers' microcomputers. Micro-to-mainframe links should significantly improve courseware offerings due to the increased power provided by a mainframe.

Although growth will be strong in this delivery mode, there is real concern that dedicated systems may duplicate other multipurpose computer systems, especially microcomputers, that are coming into place. There will be some resistance to multiple-machine approaches.

Some companies are trying a combination of CBT and video tapes to train their non-technical staff or end users. Education and training may also be delivered on PCs that users have on premises. A growing number of firms are now offering CBT authoring packages to allow users to author their own custom CBT training courses for applications.

- The Phoenix system from Goal systems is one of the most popular of these authoring systems.

- Some firms develop their own materials based on previous training experiences or the knowledge of specialists who have been hired for that purpose.

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II

Market Size and Growth

II

Market Size and Growth

INPUT estimates that by 1992 practically all workers will be influenced by a computer as part of their jobs. Over 50% of workers currently use a computer or computer output to perform their jobs.

- White collar workers are now using personal computers or terminals when they travel or at home in conjunction with their jobs as well as in their offices.

- Blue collar workers also have increasing access to computers, largely in the form of terminals tied into networks, such as on automated factory floors.

The initial goal of end-user training was to develop computer literacy: a basic awareness of computers, skill in operation of computer systems and software, and an ability to adapt new technology to business needs on an ongoing basis. End users today are increasingly interested in more advanced training.

Information systems education and training will be showing significant growth during the next five years to support this increased use of automation.

- Until recently, the emphasis has been on training or educating technical IS professionals in new skills. The emphasis has started to shift toward the training and education of end users, secretaries, managers, and executives in IS skills.

Training of IS professionals in management skills and techniques will also expand to support the growth of automation throughout the user organization.

The training market's growth is largely due to the increased number of new users who need to be trained on computers. However, after users

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master the machines, they can use the computers for all-purpose educational courses for everything from management training to stress management.

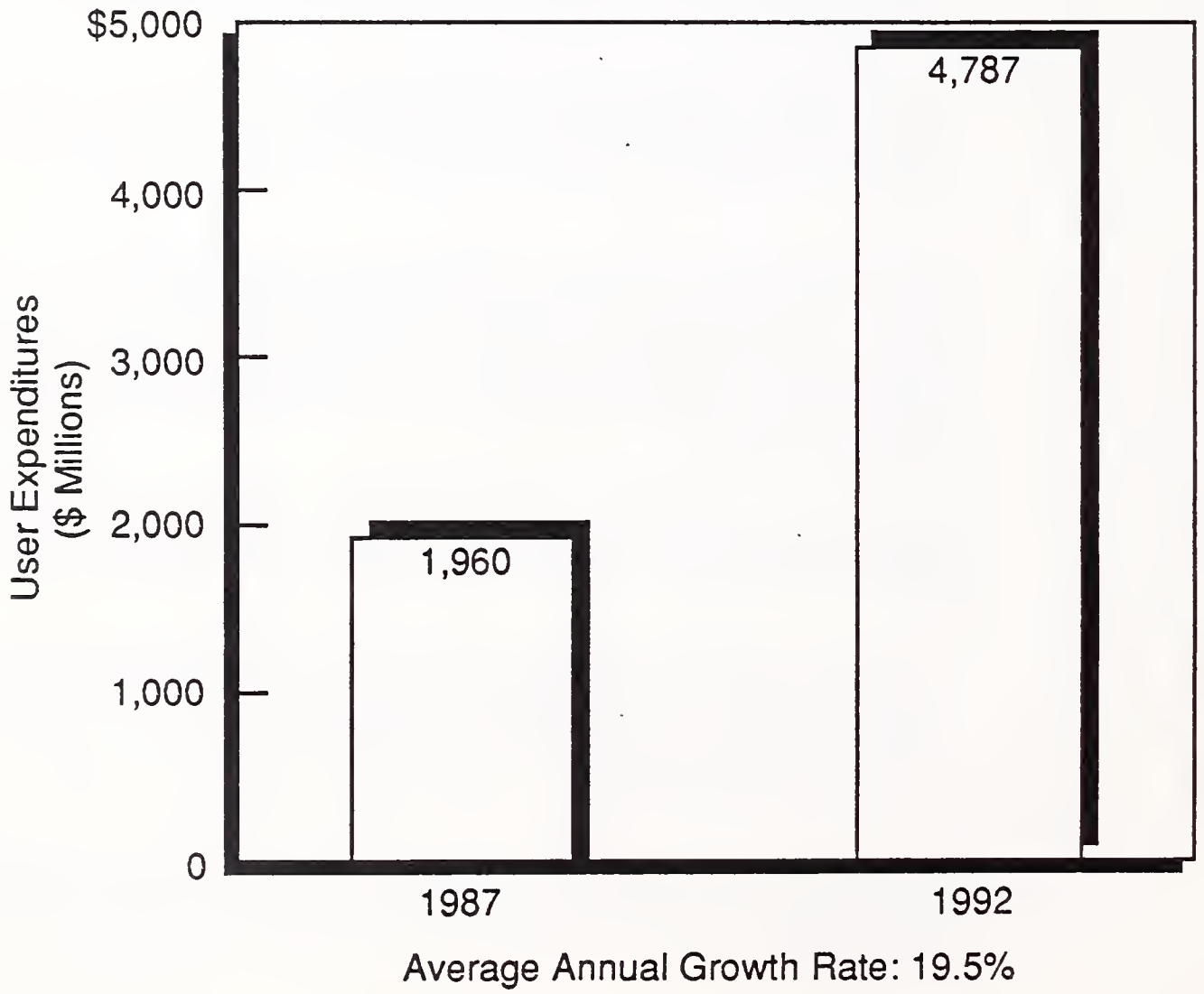
INPUT estimates that user expenditures in the U.S. in 1992 will be 4.7 billion dollars for education and training contracted with outside vendors.

A considerably larger expenditure for training done by the in-house staff is not included in this forecast. Only the services or applications purchased from outside vendors are counted. Some of these services will be purchased for use by internal training people to develop or present courses.

Market size and growth rates are shown in Exhibits II-1 and II-2.

EXHIBIT II-1

EDUCATION AND TRAINING SECTOR MARKET FORECAST
CROSS-INDUSTRY INFORMATION SERVICES, 1987-1992*



*Includes Professional Services

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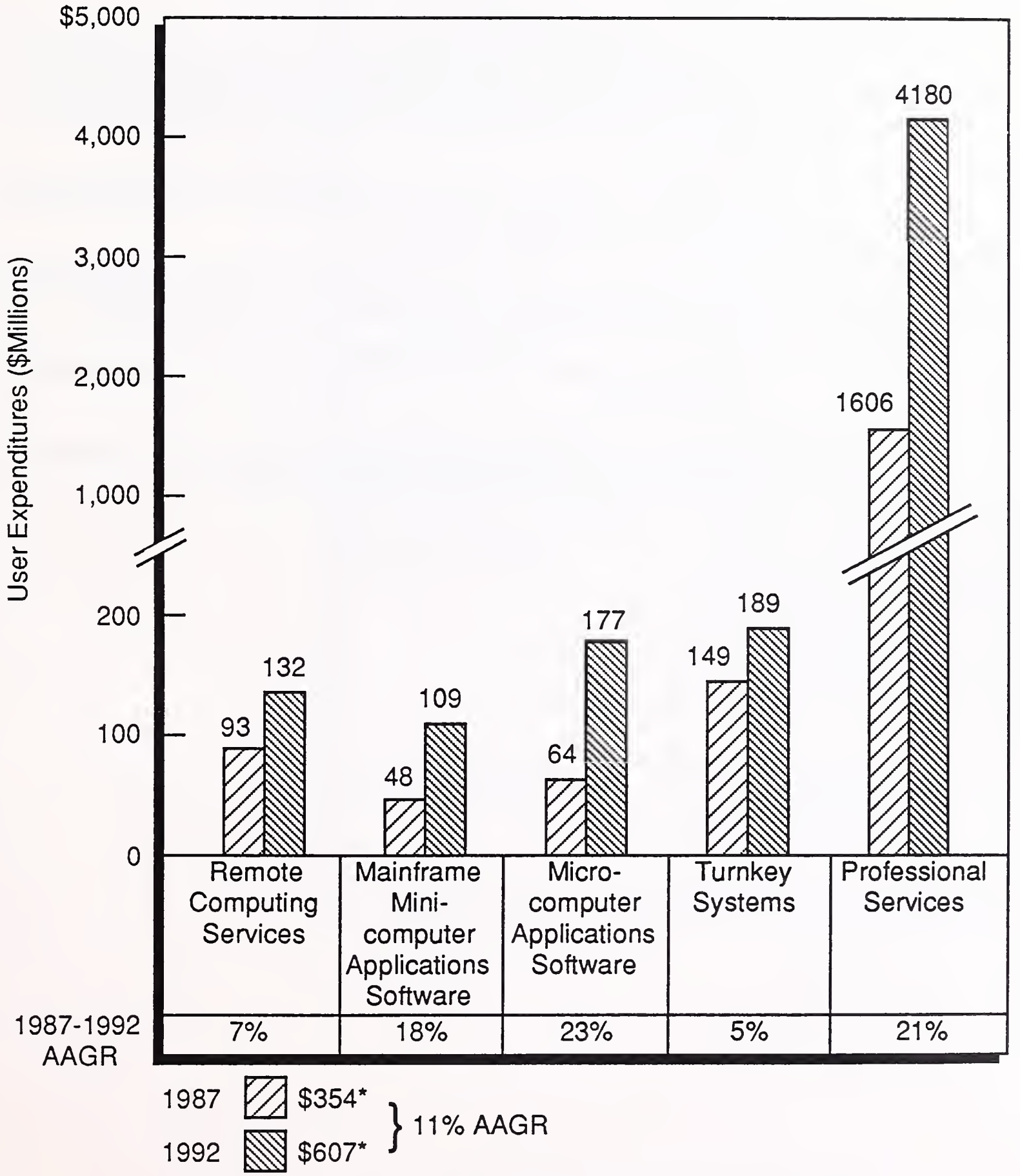
EXHIBIT II-2

EDUCATION AND TRAINING SECTOR GROWTH 1987-1992



*Total User Expenditures ($ Millions) Not Including Professional Services.

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- Microcomputer software will experience the fastest growth, rising at a 23% average annual growth rate (AAGR).

- Mainframe software, traditionally the largest computer-based training delivery mode, has now been surpassed by the microcomputer CBT market.

- Professional services for education and training, which include consulting, live instruction, and participative video instruction, is by far the largest delivery mode, totaling $1.6 billion in 1987 and increasing to $4.1 billion by 1992, reflecting a 21% annual growth rate.

The relation of educational and training products to the mainline role of IS vendors is illustrated in Exhibit II-3.

- Major computer systems firms including IBM, DEC, Unisys, Control Data, and Honeywell are very active in the education market.

Appendix ET contains data for market sizes by delivery mode for each year 1986-1992.

- Professional service, including "Big 8" firms, are more numerous and contribute the greatest amount of market revenue.

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EXHIBIT II-3

RELATION OF EDUCATION/TRAINING TO ROLE OF I.S. VENDORS

TYPES OF EDUCATION AND TRAINING PRODUCTS	ROLE OF I.S. VENDORS
Live classroom instruction	Firms with professional services business market this service
Self study, including computer books, manuals, audio cassettes, and visual (e.g., slides) and audiovisual (e.g., VCR)	Professional services, systems manufacturers, and software firms may sell these products for IS and end-user training
Interactive video and computer-based training (CBT), including computer-assisted instruction (CAI)	Professional services vendors market and present these courses; software, computer systems manufacturers, and turnkey vendors as well as professional services may sell this courseware for internal usage
Authoring systems	Developed and sold by professional services, software, and turnkey vendors

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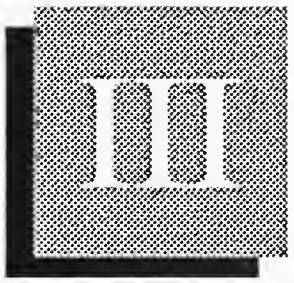

Competitive Considerations

III

Competitive Considerations

A

Introduction

Due to rapid changes in technology, many companies have been emphasizing technical training. Many managers view management training as "an extra that's nice to have."

The thesis in the large companies who have been promoting technical training is that the correct use of technology will promote productivity.

- Efforts have been taken to improve the productivity of technical people by teaching them how to use technical facilities like a DBMS more effectively or to manage the performance on tasks in a project with more understanding.

- A view of internally and externally given lecture courses has addressed all aspects of IS performance.

It is now recognized that managers who have come up the ranks from the technical side need education to change their means of motivation. Technical people, for example, may have forgotten their motivation from writing a piece of code and getting it to work. These managers must now learn to become motivated by having their staff do a successful job on the technical "nuts and bolts" of projects.

Recently, it has also become evident that IS managers need more knowledge of functions within their companies such as manufacturing, accounting, and marketing as well as skills in managing and working with people.

- Courses are now being introduced on business subjects that can be tailored to the specific needs of a corporation.

- Courses are also being developed, to a large extent by new small firms, that address interpersonal skills and managing IS personnel.

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Many of the new management oriented courses were introduced in university curricula for business management and then packaged by educational firms for delivery to the market.

The director of education and training found it much easier in the past to address a limited range of technical courses. Today, there is a vast array of technical courses that can be delivered in many ways as well as a number of offerings that deal with management training.

The suppliers of training for IS personnel and end users vary in their use of IS, the products that they deliver, and quality. The major sources of training are computer systems and software manufacturers, training (professional) services firms, training package vendors, and in-house resources. Each of these sources has value.

- Computer systems and software vendors have a variety of courses that provide training in their products.

- The (professional services) training vendor has concentrated upon how to train.

- The in-house resources know the company and the IS department and end-user needs and applications.

The education and training marketplace has become quite complex, however, since many vendors are entering or expanding their product offerings.

- Computer systems vendors including IBM and DEC obtain substantial revenues from education and training, and other computer systems vendors have become aware of the opportunity and are attempting to increase earnings in this marketplace.

- Some computer systems and software vendors have increased their education/training offerings to address not only computer systems and software products but also general technical or management subjects such as communications, project management, human resources, and other management skills.

- Specialized IS training firms such as ASI and Deltak are also expanding their training offerings. ASI, for example, now provides training in the use of human resource systems. Many professional service vendors offer education and training services to support the installation of systems that they develop. Some are extending their training to address technical needs, particularly of end users. Both Advanced Systems and Deltak have expanded their product lines by contracting to market and distribute training courses designed by other manufacturers. Advanced

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Systems has an agreement with American Training International; Deltak has linked with Cdex Corp.

A number of new vendors are entering this marketplace. MTech, which offers processing services to the banking industry, markets CBT systems in banking application areas as well as in courseware design.

The growing complexity of the marketplace has been matched by corresponding development in the use of the in-house staff to select or develop products to meet internal training needs.

A listing of the leading vendors for authoring systems and courseware offerings is shown in Exhibits III-1 and III-2.

EXHIBIT III-1

REPRESENTATIVE VENDORS OF AUTHORING SYSTEMS

AUTHORING SYSTEM	VENDOR
<u>Microcomputer-based</u>	
Authority	Interactive Training Systems
Maestro	Amtech
Teachers Aide	Selection Systems Inc.
Professional Authoring Software	Bell and Howell
Video Courseware Development	Bell and Howell
<u>Mainframe-Based</u>	
Interactive Instructional Systems	IBM
Phoenix	Goal Systems International
Plato	Control Data Corp.
Scholar/Teach 3	Boeing Computer Services

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EXHIBIT III-2

REPRESENTATIVE VENDORS OF COURSEWARE

Microcomputer-Based

Cdex-Intellisance Corp.
Applied Data Research
Wicat Systems, Inc.
On-Line Computer Systems Inc.
Goal Systems International

Mainframe-Based

Crwth Computer Courseware
Control Data Corp.
Boeing Computer Services
Advanced Systems, Inc.
Goal Systems
Unisys

Multi-Media Training

Advanced Systems, Inc.
Deltak (subsidiary of National Education Corp.)
Edutronics (subsidiary of McGraw-Hill)
Interactive Training Systems

B.

Vendor Profiles

1. Advanced Systems, Inc.
(155 East Algonquin Road, Arlington Heights, IL 60005)

a. Products/Services

Advanced Systems Inc. (ASI) is the leading independent provider of educational and training courses.

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- ASI provides live instruction, video-assisted education, computer-based training (micro and mainframe), and interactive video instruction alone or in combination to achieve education and training goals.

- ASI offers training services in a number of subjects including a variety of information system skills, end-user computing, manufacturing, and human resource development. These offerings include acquired courses as well as internally.

- ASI also offers consultation in the selection and development of a program of training services which provides a customized response to specific client needs.

b. Markets Served

Education, training, and related consulting services are marketed on an international basis to corporate and government clients.

c. Company Strategy

ASI attempts to maintain its visibility as a leading vendor of computer related courses by adding new course material on a regular basis and providing all modes of education and training from live classroom to CBT.

This vendor is also trying to leverage its reputation as an educator by offering consulting services on education and training to promote greater use of its products.

d. Recent Activities/Events

Fiscal 1986 revenue showed an increase of 18.5% from FY 1985.

ASI has been a leader in expanding training in information systems to other areas such as human resources.

e. Future Directions

ASI can be expected to further respond to the demands for training in functional subjects and for aid in developing in-house course material.

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2. Goal Systems International, Inc. (Goal Systems Building, 5445 North High St., Columbus, OH 43214)

a. Products/Services

Goal Systems offers software for computer-based training (CBT) and professional services to develop custom courseware for CBT as well as other IS products not involved with education and training.

- The primary CBT product of Goal Systems is Phoenix, which was acquired from Ohio State University. It is an application development system that allows users to develop instructional courses utilizing CBT.

- The Phoenix product is also used to provide customization in education and training.

- Computer-based training is one of the four major product groups of Goal. The other three groups cover software products related to System Management Utilities, Application Development Systems, and Computer Security.

b. Markets Served

The company's CBT offerings are sold on an international basis. Over 80% of sales are in the U.S.

The CBT offerings are marketed for use on IBM and compatible mainframes.

c. Company Strategy

Goal Systems has marketed its computer-based training services as part of a group of VM, MVS, and VSE software products offered to IS departments to meet development and operational needs.

Recent strategy has also emphasized the use of Phoenix to meet a variety of current pressures such as educating employees on company methods and procedures, policies, and application systems.

d. Recent Activities/Events

Sales of the Phoenix product accounted for 25% of the revenue of Goal Systems during fiscal year 1987.

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e. Future Directions

Goal Systems is expected to take further advantage of the demand for expanded and customized internal training courses through use of the Phoenix together with professional service assistance.

3. Control Data Corporation (8100 34th Avenue South, Minneapolis, MN 55440)

a. Products/Services

CDC has been in the education and training market for 25 years.

- CDC delivers its courses on microcomputers in local area networks (LAN).
- CDC has a growing number of products using micro-based technology.
- Its worldwide operations are a benefit to customers with facilities in many nations that need training.

b. Markets Served

Through its network of training facilities in over 50 cities internationally, CDC provides education and training to business and industry, schools and universities, consumers, the government, and the military.

c. Company Strategy

As part of the restructuring of 1986, the Training and Education group was formed to bring together several of the U.S. training units into one body that would serve multiple markets. This group will provide training and education based on a core set of CDC proprietary products.

The T&E group is targeting the following marketing whose needs can be met by the value-added products.

- Manufacturing and aviation.
- Computer-related areas of consumer vocational training.
- Job training sectors of the government-funded market.
- Kindergarten through Junior college sector of education (K-14).

The new Training and Education group was formed in November of 1986 as part of the restructuring of Control Data.

d. Recent Activities/Events

Fiscal 1986 revenue was approximately $90 million, but the group was not profitable.

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With the dissolution of the joint venture of PLATO/WICAT, T&E has had to redirect its efforts to proceed in the K-14 market.

e. Future Directions

T&E has intentions of building on Control Data's reputation for quality education and training courses.

4. SAS Institute (Box 8000, SAS Circle, Cary, NC 27511-8000)

a. Products/Services

The education and training products are an integrated part of the SAS set of statistical analysis, graphical, and data management products which have been widely marketed and used. These products are also sold to impart a working understanding of solving graphical and statistical problems with a computer.

- Instructor-based training as well as video- and computer-based training is provided at major hotels and five training centers.

- Ready-to-use CBT courses and authoring tools for writing CBT courses are available for use at customer sites.

b. Markets Served

SAS products and training are available on an international basis. Training centers are located in the U.S. and Canada.

Courses have been developed for mainframe, mini, and PC users of SAS Software.

c. Company Strategy

Education and training is necessary to utilize the type of software products marketed by SAS, and the company's success is somewhat tied to its integration of training with use of these tools.

Education and training products have been expanded and supplemented with general statistical and mathematical courses including modeling and forecasting to increase revenue from the SAS product line and customer base.

d. Recent Activities/Events

Revenues of over $8 million were obtained in fiscal year 1986 from education and training.

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e. Future Directions

SAS can be expected to continue to expand education and training in the interpretation and manipulation of data since the need for this type of service is significantly large and growing.

5. Arthur Andersen
(1405 North Fifth Ave., Saint Charles, IL 60174)

a. Products/Services

Arthur Andersen provides educational consulting or professional seminar program and in-house training in computer related and business subjects through an educational services division.

- Instruction is offered through interactive video, computer-based training, embedded training, computer managed instruction, and live presentations.

- Subject matter focuses on the use of information, application systems, system planning, and microcomputer use as well as upon accounting, auditing, and management development.

- Consulting aid is also provided to assess training needs and design a curriculum.

b. Markets Served

These services are marketed on an international basis to clients and prospects of Arthur Andersen.

c. Company Strategy

Education and training is used as part of a total approach toward solving business problems of clients.

d. Recent Activities/Events

Fiscal 1986 revenue for education and training was about $7 million.

Arthur Andersen presented an intensive seminar in both 1986 and 1987 in support of system integration that utilized education and training techniques to promote its product developments.

e. Future Directions

One of the firm's chief interests, automation in manufacturing, should result in increasing educational offerings in support of new techniques.

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6. IBM (Armonk, NY)

a. Products/Services

In view of its size, IBM is the largest provider of computer-related education and training products and services. Other computer vendors such as DEC, Unisys, and Amdahl are also known for educational products and have also expanded their offerings to gain revenue.

- Products focus upon learning to utilize the software and hardware of IBM, although many general courses are offered in data communications, structured methodology, and projects management, for example.

- Live training is the leading mode for presentation, but IBM offers training that utilizes video and computer capabilities.

b. Markets Served

IBM and its rivals offer products on an international basis utilizing worldwide facilities.

Courses are offered to all vertical markets and in some cases are tailored to particular industries.

c. Company Strategy

IBM and other vendor courses not only support the use of its software and hardware, but also promote the advantage of certain facilities or capabilities that are provided.

IBM courses, particularly the offerings of its subsidiary, SRA, also promote a high level of professionalism which supports the company's image in general.

d. Recent Activities/Events

An estimate of $160 million in revenue resulted from education and training services in 1987.

e. Future Directions

IBM can be expected to maintain a greater dedication to live training than many vendors devoted to education and training as a business. IBM will probably display innovation in training, however, as part of its offerings to demonstrate its interest in new capabilities.

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7. Yourdon Corp.
(1501 Broadway, New York, NY 10036)

a. Products/Services

This firm and several others are known for training and education related to software engineering or system development methodology, but Yourdon has enlarged its course offerings to cover system software, software engineering, personal computers, and other media.

- Instruction is offered through live presentations in a seminar format.

- Subject matter includes structured analysis and design, information modeling, project planning, expert systems, MVS, CICS, and personal computers.

- Yourdon also markets consulting services related to education and training that focus on needs in regard to software engineering.

b. Markets Served

The products are marketed on an international basis.

c. Company Strategy

Yourdon presents an integrated approach in sales of seminars, consulting, and a software engineering product, the ANALYST/DESIGNER TOOLKIT ™. By using this approach, Yourdon attempts to market more than just education and training to a prospect.

Yourdon emphasizes that its services involve more than just a seminar seat.

d. Recent Activities/Events

Yourdon had revenues of about $10 million in fiscal year 1986.

Yourdon has profited from the recent growth in sales of software engineering products and services.

e. Future Directions

Yourdon can be expected to increase its course offerings and consulting services to meet the growth of interest in CASE.

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IV

New Opportunities

IV

New Opportunities

Introducing and measuring the effectiveness of management oriented training has become an additional challenge for IS management. One of the new offerings that has been added to management courses is aid in measuring the effectiveness of the courses and selecting or tailoring the use of future ones.

New and expanding areas in self-study include audio cassettes that offer salesmanship, management, and time management courses to be played while commuting or relaxing at home.

Similar to the self-study audio courses are the home VCR courses in areas such as management techniques, time management, and also some sales-manship.

CBT will be expanding with additional interactive, user-friendly aspects that will tailor responses to the individual.

There is also a growth area for education and training customized for industry that will use a mixture methods to simulate situations where you can try out solutions. Much of this is being done in the defense arena, where training simulators are used to mimic real-life situations and train people in the best solutions.

In view of the proliferation of educational and training products, a few vendors have started to offer guidance services to courses and other materials for the data trainer.

There will also be an integration of technical and non-technical training, as in project management training, that will draw on technical knowledge to solve project management problems.

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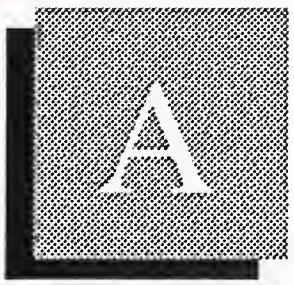

Appendix ET: Forecast Data Base: Education and Training

A

Appendix ET: Forecast Data Base: Education and Training

This appendix contains the following forecast information:

- Market size by delivery mode for each year 1986-1992.
- Market growth rate for 1986-1992.
- Average annual growth rate (AAGR) for each delivery mode for the five-year period 1987-1992.

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EXHIBIT ET-1

EDUCATION AND TRAINING SEGMENT USER EXPENDITURE FORECAST BY DELIVERY MODE, 1986-1992

SEGMENTATION BY DELIVERY MODE	1986 ($M)	1986-1987 Growth	1987 ($M)	1988 ($M)	1989 ($M)	1990 ($M)	1991 ($M)	1992 ($M)	AAGR 1987-1992 (Percent)
Remote Computing/ Batch	84	11	93	104	113	119	127	132	7
Applications Software									
Mainframe/Mini	37	30	48	58	71	84	95	109	18
Micro	50	28	64	79	94	119	148	177	23
Total Applications Software	87	29	112	137	165	203	243	286	21
Turnkey Systems	137	9	149	157	168	177	183	189	5
Cross-Industry Total	308	15	354	398	446	499	553	607	11
Professional Services*	1,313	22	1,606	1,910	2,304	2,785	3,384	4,180	21

*Education and training professional services data are not included as part of the total for the education and training segment because they are included as part of the professional services segment.

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About INPUT

INPUT provides planning information, analysis and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, communications, and office products and services.

The company carries out continuous and in-depth research. Working closely with clients on important issues, INPUT's staff members analyze and interpret the research data, then develop recommendations and innovative ideas to meet clients' needs. Clients receive reports, presentations, access to data on which analyses are based, and continuous consulting.

Many of INPUT's professional staff members have nearly 20 years experience in their areas of specialization. Most have held senior management positions in operations, marketing, or planning, This expertise enables INPUT to supply practical solutions to complex business problems.

Formed in 1974, INPUT has become a leading international planning services firm. Clients include over 100 of the world's largest and most technically advanced companies.

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CROSS-INDUSTRY MARKETS, 1987-1992

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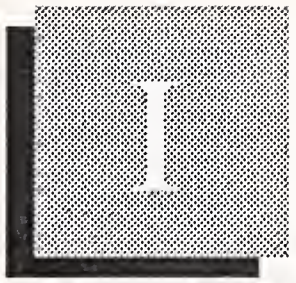

Issues and Trends

I

Issues and Trends

A

Introduction

INPUT analyzes education and training both as a vertical industry and as a cross-industry professional service.

As shown in Exhibit I-1, the cross-industry education and training services that IS vendors sell can be added together for all markets but education.

When education and training products such as a training course available on remote processing or on a diskette to load into a PC are sold by an IS vendor to the education market for use in schools, they are considered by INPUT to be part of the vertical market of education.

As later exhibits illustrate, the market for IS cross-industry education and training will include:

- Processing.
- Applications software for micro, mini, or mainframe computers.
- Turnkey systems.
- Professional services.

For the purposes of this report, "education and training professional services" refers only to training on computers and computing and management courses for IS professionals. Other modes – such as software and processing services – include training relating to other subjects in addition to computers and computing.

Education that occurs in educational institutions (i.e., schools) is forecast in the Education Industry-Specific segment, found in the report *U.S. Information Services Industry-Specific Markets, 1987-1992*. This report covers only the cross-industry segment of education and training market.

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EXHIBIT I-1

I.S. CROSS-INDUSTRY EDUCATION AND TRAINING

CROSS-INDUSTRY APPLICATION	SELECTED VERTICAL MARKETS			
	Banking/ Finance	Insurance	Manufacturing	Education
General Accounting	X	X	X	X
Human Resources	X	X	X	X
Education and Training	X	X	X	-

"X" shows the usage that is part of a cross-industry total.

IS education and training can be examined in terms of the following services:

- Classroom or live instruction,
- Multimedia and interactive video (IVI),
- Computer-based training (CBT), which includes computer-assisted instruction (CAI) and computer-managed instruction (CMI).
- Self study

Both white and blue collar workers will be exposed to several types of training from IS vendors. One type of training will concern using computers for specific job functions. The second type of training will involve the use of computers to train workers in procedures, techniques, and new systems.

- Training programs on the operation of complex financial and manufacturing systems are now being provided on computers.

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- Complex new procedures in factory automation will be taught to workers through simulation and other computer-based techniques.

End-user courseware is sold in two forms – packaged and custom. Packaged courseware has become very popular due to the cost-effectiveness of its delivery.

The major issues in this market are discussed below by mode of delivery.

B

Classroom or Live Instruction

Live classroom training comprises approximately 70% of the training market. Of the classroom training mode, about 60% is off-site training as opposed to 40% for on-site training.

- Live training or lecturing is the easiest mode for a small firm to use when entering the business.

- When a new technical area such as network integration or a functional or management subject such as merchant banking must be addressed, the easiest method for gaining knowledge may be to hire a consultant to provide live training.

Live or classroom training may make use of slides, overheads, and other media to support instruction. Several lecturers can divide the material presented in a lecture and offer contrasting styles to maintain interest.

There has been a tendency for some vendors to replace live training with CBT or IVI training during the last few years in order to reduce costs associated with travel and other expenses.

- Many corporations have shown reawakened interest in live training during this period since a constant diet of CBT or IVI courses can be unpopular.

- Live teachers can also provide much more feedback on personnel and recommend meaningful changes in education.

- Live instruction has also become more popular than CBT and IVI in teaching interpersonal management skills where group interaction is an important part of the course.

There is a great deal of competition among vendors of live instruction. Barriers are low, and many smaller companies spring up that specialize in a single course or a specific topic area.

INPUT predicts that companies who have practically eliminated live instruction will reintroduce it in their services.

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C

Self Study

Self study comprises approximately 15% of the education and training market. Of this, about one-third is captive study on product-specific programs and two-thirds is generic instruction.

Self study constitutes one of the necessary adjuncts to training for busy executives and technical people.

A number of new techniques for self study have emerged including cassettes for the busy executive to play on a car audio system and material developed for presentation on VCRs and home computers.

D

Multimedia and Interactive Video (IVI)

This area has expanded during the last five years. Basically, it uses video instruction and adds an interactive phase to it. Respondents are questioned on information and a tailored response to their answers is given on video and possibly audio.

- Many of the basic ideas that are being used in IVI have been taken from experiments in childhood education: Sounds that keep a student attentive or a response that might embarrass students who have not been paying attention keep the session moving and the student attentive.

- Interactive education with pictures and sound has been found to be a highly successful means of imparting knowledge.

This form of training has been used successfully in the areas of sales and management as well as technical training.

E

Computer-Based Training (CBT)

The use of CBT in education and training is expanding. INPUT's definition of this segment includes:

- In the education and training segment, all methods for training users how to use computer systems, as well as using computers (CBT) to train workers in any subject, including non-computer topics.

- Computer-based training refering to any training activity in which computers are used to either a) present material that is to be learned, b) provide practice activities or tests on material presented through other media, or c) manage the administration of courses using computers.

- For the purposes of our forecasts, CBT includes CAI (computer-assisted instruction) and CMI (computer-managed instruction).

This is a large growth area for vendors who use computers to deliver or aid in the delivery of instruction for technical and semi-technical skills.

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Retention of course material has been shown to be high when students actively take part in the instruction as is done in the interactive video area.

In the early 1980s, CBT courses had a very sparse existence on mainframes, minicomputers, or microcomputers. This has been changing over the last few years as major suppliers, software companies, and computer systems manufacturers are all getting on the CBT bandwagon and offering courses to end users.

CBT is being used to teach the following areas:

- Information systems skills.
- Technical skills.
- Software applications.
- Management capabilities, such as:
  - Project management.
  - Resource allocation.
  - Personnel dynamics.
  - Human resources.

The future uses of CBT cover a wide range of topics, and CBT will experience increases in the areas of :

- Training end users in systems and procedures, e.g., tellers, clerical workers, mechanics, and repair people.

- Users requiring technical training.

CBT systems can be used to present text, graphics, practice activities, simulations, and questions and to provide feedback.

The advantages of CBT include:

- Reduced costs of providing instruction.
- Increased flexibility in presenting instructional material.
- Convenience.
- Uniformity.

CBT courses are normally distributed to users by terminals connected to a mainframe (or minicomputer) at a vendor's location or from an in-house site or by standalone microcomputers.

Microcomputer applications software has been a fast growth area in this sector. Factors stimulating the market include the declining cost of both computer systems and software, the availability of microcomputers in large numbers, and the tremendous need for hands-on computer training.

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Due to the increased availability of presentation systems, ASI, a leading education training vendor, anticipates delivering courses via telecommunications in the near future. They expect to download courses from their mainframe to customers' microcomputers. Micro-to-mainframe links should significantly improve courseware offerings due to the increased power provided by a mainframe.

Although growth will be strong in this delivery mode, there is real concern that dedicated systems may duplicate other multipurpose computer systems, especially microcomputers, that are coming into place. There will be some resistance to multiple-machine approaches.

Some companies are trying a combination of CBT and video tapes to train their non-technical staff or end users. Education and training may also be delivered on PCs that users have on premises. A growing number of firms are now offering CBT authoring packages to allow users to author their own custom CBT training courses for applications.

- The Phoenix system from Goal systems is one of the most popular of these authoring systems.

- Some firms develop their own materials based on previous training experiences or the knowledge of specialists who have been hired for that purpose.

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III

Market Size and Growth

Market Size and Growth

INPUT estimates that by 1992 practically all workers will be influenced by a computer as part of their jobs. Over 50% of workers currently use a computer or computer output to perform their jobs.

- White collar workers are now using personal computers or terminals when they travel or at home in conjunction with their jobs as well as in their offices.

- Blue collar workers also have increasing access to computers, largely in the form of terminals tied into networks, such as on automated factory floors.

The initial goal of end-user training was to develop computer literacy: a basic awareness of computers, skill in operation of computer systems and software, and an ability to adapt new technology to business needs on an ongoing basis. End users today are increasingly interested in more advanced training.

Information systems education and training will be showing significant growth during the next five years to support this increased use of automation.

- Until recently, the emphasis has been on training or educating technical IS professionals in new skills. The emphasis has started to shift toward the training and education of end users, secretaries, managers, and executives in IS skills.

Training of IS professionals in management skills and techniques will also expand to support the growth of automation throughout the user organization.

The training market's growth is largely due to the increased number of new users who need to be trained on computers. However, after users

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master the machines, they can use the computers for all-purpose educational courses for everything from management training to stress management.

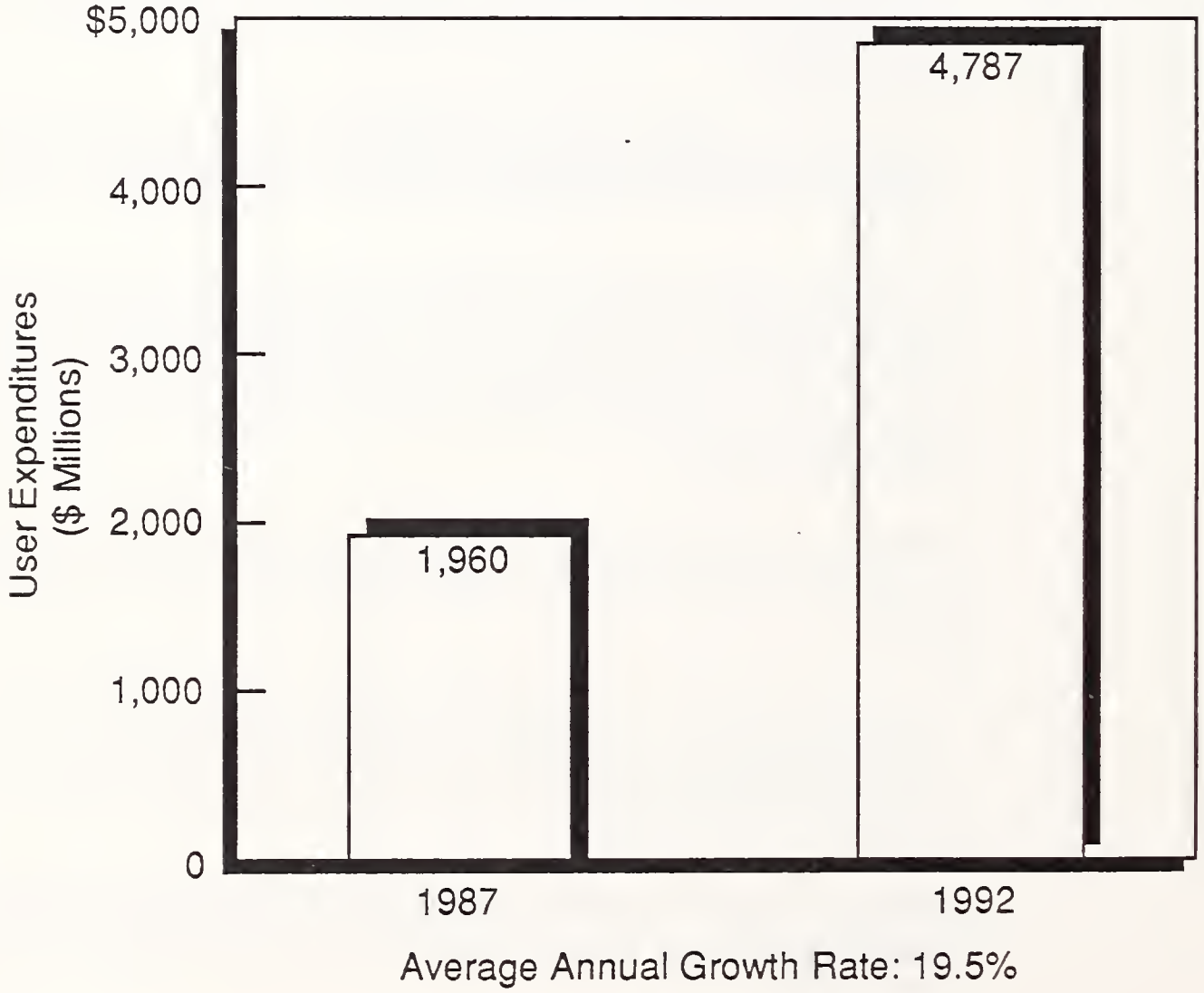
INPUT estimates that user expenditures in the U.S. in 1992 will be 4.7 billion dollars for education and training contracted with outside vendors.

A considerably larger expenditure for training done by the in-house staff is not included in this forecast. Only the services or applications purchased from outside vendors are counted. Some of these services will be purchased for use by internal training people to develop or present courses.

Market size and growth rates are shown in Exhibits II-1 and II-2.

EXHIBIT II-1

EDUCATION AND TRAINING SECTOR MARKET FORECAST CROSS-INDUSTRY INFORMATION SERVICES, 1987-1992*



*Includes Professional Services

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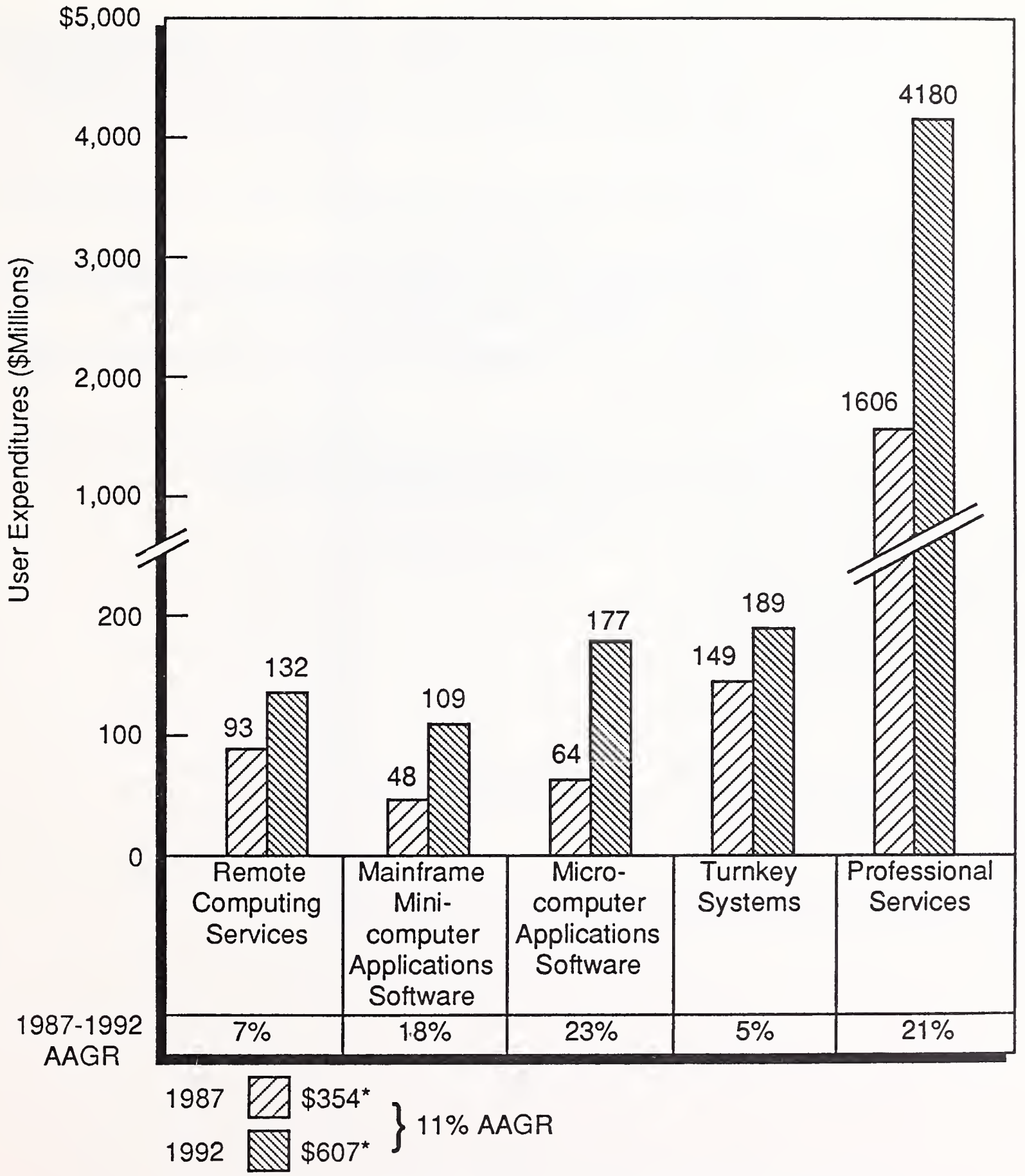
EXHIBIT II-2

EDUCATION AND TRAINING SECTOR GROWTH
1987-1992



*Total User Expenditures ($ Millions) Not Including Professional Services.

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- Microcomputer software will experience the fastest growth, rising at a 23% average annual growth rate (AAGR).

- Mainframe software, traditionally the largest computer-based training delivery mode, has now been surpassed by the microcomputer CBT market.

- Professional services for education and training, which include consulting, live instruction, and participative video instruction, is by far the largest delivery mode, totaling $1.6 billion in 1987 and increasing to $4.1 billion by 1992, reflecting a 21% annual growth rate.

The relation of educational and training products to the mainline role of IS vendors is illustrated in Exhibit II-3.

- Major computer systems firms including IBM, DEC, Unisys, Control Data, and Honeywell are very active in the education market.

Appendix ET contains data for market sizes by delivery mode for each year 1986-1992.

- Professional service, including "Big 8" firms, are more numerous and contribute the greatest amount of market revenue.

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EXHIBIT II-3

RELATION OF EDUCATION/TRAINING TO ROLE OF I.S. VENDORS

TYPES OF EDUCATION AND TRAINING PRODUCTS	ROLE OF I.S. VENDORS
Live classroom instruction	Firms with professional services business market this service
Self study, including computer books, manuals, audio cassettes, and visual (e.g., slides) and audiovisual (e.g., VCR)	Professional services, systems manufacturers, and software firms may sell these products for IS and end-user training
Interactive video and computer-based training (CBT), including computer-assisted instruction (CAI)	Professional services vendors market and present these courses; software, computer systems manufacturers, and turnkey vendors as well as professional services may sell this courseware for internal usage
Authoring systems	Developed and sold by professional services, software, and turnkey vendors

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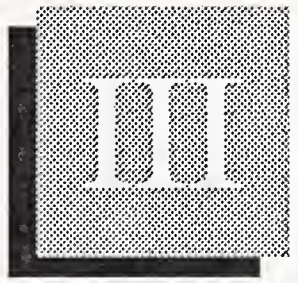

Competitive Considerations

III

Competitive Considerations

A

Introduction

Due to rapid changes in technology, many companies have been emphasizing technical training. Many managers view management training as "an extra that's nice to have."

The thesis in the large companies who have been promoting technical training is that the correct use of technology will promote productivity.

- Efforts have been taken to improve the productivity of technical people by teaching them how to use technical facilities like a DBMS more effectively or to manage the performance on tasks in a project with more understanding.

- A view of internally and externally given lecture courses has addressed all aspects of IS performance.

It is now recognized that managers who have come up the ranks from the technical side need education to change their means of motivation. Technical people, for example, may have forgotten their motivation from writing a piece of code and getting it to work. These managers must now learn to become motivated by having their staff do a successful job on the technical "nuts and bolts" of projects.

Recently, it has also become evident that IS managers need more knowledge of functions within their companies such as manufacturing, accounting, and marketing as well as skills in managing and working with people.

- Courses are now being introduced on business subjects that can be tailored to the specific needs of a corporation.

- Courses are also being developed, to a large extent by new small firms, that address interpersonal skills and managing IS personnel.

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Many of the new management oriented courses were introduced in university curricula for business management and then packaged by educational firms for delivery to the market.

The director of education and training found it much easier in the past to address a limited range of technical courses. Today, there is a vast array of technical courses that can be delivered in many ways as well as a number of offerings that deal with management training.

The suppliers of training for IS personnel and end users vary in their use of IS, the products that they deliver, and quality. The major sources of training are computer systems and software manufacturers, training (professional) services firms, training package vendors, and in-house resources. Each of these sources has value.

- Computer systems and software vendors have a variety of courses that provide training in their products.

- The (professional services) training vendor has concentrated upon how to train.

- The in-house resources know the company and the IS department and end-user needs and applications.

The education and training marketplace has become quite complex, however, since many vendors are entering or expanding their product offerings.

- Computer systems vendors including IBM and DEC obtain substantial revenues from education and training, and other computer systems vendors have become aware of the opportunity and are attempting to increase earnings in this marketplace.

- Some computer systems and software vendors have increased their education/training offerings to address not only computer systems and software products but also general technical or management subjects such as communications, project management, human resources, and other management skills.

- Specialized IS training firms such as ASI and Deltak are also expanding their training offerings. ASI, for example, now provides training in the use of human resource systems. Many professional service vendors offer education and training services to support the installation of systems that they develop. Some are extending their training to address technical needs, particularly of end users. Both Advanced Systems and Deltak have expanded their product lines by contracting to market and distribute training courses designed by other manufacturers. Advanced

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Systems has an agreement with American Training International; Deltak has linked with Cdex Corp.

A number of new vendors are entering this marketplace. MTech, which offers processing services to the banking industry, markets CBT systems in banking application areas as well as in courseware design.

The growing complexity of the marketplace has been matched by corresponding development in the use of the in-house staff to select or develop products to meet internal training needs.

A listing of the leading vendors for authoring systems and courseware offerings is shown in Exhibits III-1 and III-2.

EXHIBIT III-1

REPRESENTATIVE VENDORS OF AUTHORING SYSTEMS

AUTHORING SYSTEM	VENDOR
Microcomputer-based	
Authority	Interactive Training Systems
Maestro	Amtech
Teachers Aide	Selection Systems Inc.
Professional Authoring Software	Bell and Howell
Video Courseware Development	Bell and Howell
Mainframe-Based	
Interactive Instructional Systems	IBM
Phoenix	Goal Systems International
Plato	Control Data Corp.
Scholar/Teach 3	Boeing Computer Services

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EXHIBIT III-2

REPRESENTATIVE VENDORS OF COURSEWARE

Microcomputer-Based

Cdex-Intellisance Corp.
Applied Data Research
Wicat Systems, Inc.
On-Line Computer Systems Inc.
Goal Systems International

Mainframe-Based

Crwth Computer Courseware
Control Data Corp.
Boeing Computer Services
Advanced Systems, Inc.
Goal Systems
Unisys

Multi-Media Training

Advanced Systems, Inc.
Deltak (subsidiary of National Education Corp.)
Edutronics (subsidiary of McGraw-Hill)
Interactive Training Systems

B.

Vendor Profiles

1. Advanced Systems, Inc.
(155 East Algonquin Road, Arlington Heights, IL 60005)

a. Products/Services

Advanced Systems Inc. (ASI) is the leading independent provider of educational and training courses.

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- ASI provides live instruction, video-assisted education, computer-based training (micro and mainframe), and interactive video instruction alone or in combination to achieve education and training goals.

- ASI offers training services in a number of subjects including a variety of information system skills, end-user computing, manufacturing, and human resource development. These offerings include acquired courses as well as internally.

- ASI also offers consultation in the selection and development of a program of training services which provides a customized response to specific client needs.

b. Markets Served

Education, training, and related consulting services are marketed on an international basis to corporate and government clients.

c. Company Strategy

ASI attempts to maintain its visibility as a leading vendor of computer related courses by adding new course material on a regular basis and providing all modes of education and training from live classroom to CBT.

This vendor is also trying to leverage its reputation as an educator by offering consulting services on education and training to promote greater use of its products.

d. Recent Activities/Events

Fiscal 1986 revenue showed an increase of 18.5% from FY 1985.

ASI has been a leader in expanding training in information systems to other areas such as human resources.

e. Future Directions

ASI can be expected to further respond to the demands for training in functional subjects and for aid in developing in-house course material.

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2. Goal Systems International, Inc. (Goal Systems Building, 5445 North High St., Columbus, OH 43214)

a. Products/Services

Goal Systems offers software for computer-based training (CBT) and professional services to develop custom courseware for CBT as well as other IS products not involved with education and training.

- The primary CBT product of Goal Systems is Phoenix, which was acquired from Ohio State University. It is an application development system that allows users to develop instructional courses utilizing CBT.

- The Phoenix product is also used to provide customization in education and training.

- Computer-based training is one of the four major product groups of Goal. The other three groups cover software products related to System Management Utilities, Application Development Systems, and Computer Security.

b. Markets Served

The company's CBT offerings are sold on an international basis. Over 80% of sales are in the U.S.

The CBT offerings are marketed for use on IBM and compatible mainframes.

c. Company Strategy

Goal Systems has marketed its computer-based training services as part of a group of VM, MVS, and VSE software products offered to IS departments to meet development and operational needs.

Recent strategy has also emphasized the use of Phoenix to meet a variety of current pressures such as educating employees on company methods and procedures, policies, and application systems.

d. Recent Activities/Events

Sales of the Phoenix product accounted for 25% of the revenue of Goal Systems during fiscal year 1987.

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e. Future Directions

Goal Systems is expected to take further advantage of the demand for expanded and customized internal training courses through use of the Phoenix together with professional service assistance.

3. Control Data Corporation (8100 34th Avenue South, Minneapolis, MN 55440)

a. Products/Services

CDC has been in the education and training market for 25 years.

- CDC delivers its courses on microcomputers in local area networks (LAN).
- CDC has a growing number of products using micro-based technology.
- Its worldwide operations are a benefit to customers with facilities in many nations that need training.

b. Markets Served

Through its network of training facilities in over 50 cities internationally, CDC provides education and training to business and industry, schools and universities, consumers, the government, and the military.

c. Company Strategy

As part of the restructuring of 1986, the Training and Education group was formed to bring together several of the U.S. training units into one body that would serve multiple markets. This group will provide training and education based on a core set of CDC proprietary products.

The T&E group is targeting the following marketing whose needs can be met by the value-added products.

- Manufacturing and aviation.
- Computer-related areas of consumer vocational training.
- Job training sectors of the government-funded market.
- Kindergarten through Junior college sector of education (K-14).

The new Training and Education group was formed in November of 1986 as part of the restructuring of Control Data.

d. Recent Activities/Events

Fiscal 1986 revenue was approximately $90 million, but the group was not profitable.

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With the dissolution of the joint venture of PLATO/WICAT, T&E has had to redirect its efforts to proceed in the K-14 market.

e. Future Directions

T&E has intentions of building on Control Data's reputation for quality education and training courses.

4. SAS Institute (Box 8000, SAS Circle, Cary, NC 27511-8000)

a. Products/Services

The education and training products are an integrated part of the SAS set of statistical analysis, graphical, and data management products which have been widely marketed and used. These products are also sold to impart a working understanding of solving graphical and statistical problems with a computer.

- Instructor-based training as well as video- and computer-based training is provided at major hotels and five training centers.

- Ready-to-use CBT courses and authoring tools for writing CBT courses are available for use at customer sites.

b. Markets Served

SAS products and training are available on an international basis. Training centers are located in the U.S. and Canada.

Courses have been developed for mainframe, mini, and PC users of SAS Software.

c. Company Strategy

Education and training is necessary to utilize the type of software products marketed by SAS, and the company's success is somewhat tied to its integration of training with use of these tools.

Education and training products have been expanded and supplemented with general statistical and mathematical courses including modeling and forecasting to increase revenue from the SAS product line and customer base.

d. Recent Activities/Events

Revenues of over $8 million were obtained in fiscal year 1986 from education and training.

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e. Future Directions

SAS can be expected to continue to expand education and training in the interpretation and manipulation of data since the need for this type of service is significantly large and growing.

5. Arthur Andersen (1405 North Fifth Ave., Saint Charles, IL 60174)

a. Products/Services

Arthur Andersen provides educational consulting or professional seminar program and in-house training in computer related and business subjects through an educational services division.

- Instruction is offered through interactive video, computer-based training, embedded training, computer managed instruction, and live presentations.

- Subject matter focuses on the use of information, application systems, system planning, and microcomputer use as well as upon accounting, auditing, and management development.

- Consulting aid is also provided to assess training needs and design a curriculum.

b. Markets Served

These services are marketed on an international basis to clients and prospects of Arthur Andersen.

c. Company Strategy

Education and training is used as part of a total approach toward solving business problems of clients.

d. Recent Activities/Events

Fiscal 1986 revenue for education and training was about $7 million.

Arthur Andersen presented an intensive seminar in both 1986 and 1987 in support of system integration that utilized education and training techniques to promote its product developments.

e. Future Directions

One of the firm's chief interests, automation in manufacturing, should result in increasing educational offerings in support of new techniques.

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6. IBM (Armonk, NY)

a. Products/Services

In view of its size, IBM is the largest provider of computer-related education and training products and services. Other computer vendors such as DEC, Unisys, and Amdahl are also known for educational products and have also expanded their offerings to gain revenue.

- Products focus upon learning to utilize the software and hardware of IBM, although many general courses are offered in data communications, structured methodology, and projects management, for example.

- Live training is the leading mode for presentation, but IBM offers training that utilizes video and computer capabilities.

b. Markets Served

IBM and its rivals offer products on an international basis utilizing worldwide facilities.

Courses are offered to all vertical markets and in some cases are tailored to particular industries.

c. Company Strategy

IBM and other vendor courses not only support the use of its software and hardware, but also promote the advantage of certain facilities or capabilities that are provided.

IBM courses, particularly the offerings of its subsidiary, SRA, also promote a high level of professionalism which supports the company's image in general.

d. Recent Activities/Events

An estimate of $160 million in revenue resulted from education and training services in 1987.

e. Future Directions

IBM can be expected to maintain a greater dedication to live training than many vendors devoted to education and training as a business. IBM will probably display innovation in training, however, as part of its offerings to demonstrate its interest in new capabilities.

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7. Yourdon Corp.
(1501 Broadway, New York, NY 10036)

a. Products/Services

This firm and several others are known for training and education related to software engineering or system development methodology, but Yourdon has enlarged its course offerings to cover system software, software engineering, personal computers, and other media.

- Instruction is offered through live presentations in a seminar format.
- Subject matter includes structured analysis and design, information modeling, project planning, expert systems, MVS, CICS, and personal computers.
- Yourdon also markets consulting services related to education and training that focus on needs in regard to software engineering.

b. Markets Served

The products are marketed on an international basis.

c. Company Strategy

Yourdon presents an integrated approach in sales of seminars, consulting, and a software engineering product, the ANALYST/DESIGNER TOOLKIT ™. By using this approach, Yourdon attempts to market more than just education and training to a prospect.

Yourdon emphasizes that its services involve more than just a seminar seat.

d. Recent Activities/Events

Yourdon had revenues of about $10 million in fiscal year 1986.

Yourdon has profited from the recent growth in sales of software engineering products and services.

e. Future Directions

Yourdon can be expected to increase its course offerings and consulting services to meet the growth of interest in CASE.

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New Opportunities

IV

New Opportunities

Introducing and measuring the effectiveness of management oriented training has become an additional challenge for IS management. One of the new offerings that has been added to management courses is aid in measuring the effectiveness of the courses and selecting or tailoring the use of future ones.

New and expanding areas in self-study include audio cassettes that offer salesmanship, management, and time management courses to be played while commuting or relaxing at home.

Similar to the self-study audio courses are the home VCR courses in areas such as management techniques, time management, and also some sales-manship.

CBT will be expanding with additional interactive, user-friendly aspects that will tailor responses to the individual.

There is also a growth area for education and training customized for industry that will use a mixture methods to simulate situations where you can try out solutions. Much of this is being done in the defense arena, where training simulators are used to mimic real-life situations and train people in the best solutions.

In view of the proliferation of educational and training products, a few vendors have started to offer guidance services to courses and other materials for the data trainer.

There will also be an integration of technical and non-technical training, as in project management training, that will draw on technical knowledge to solve project management problems.

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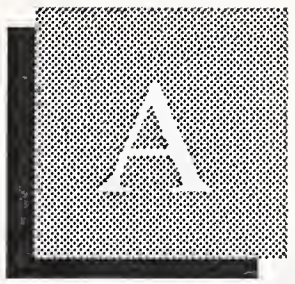

Appendix ET: Forecast Data Base: Education and Training

Appendix ET: Forecast Data Base: Education and Training

This appendix contains the following forecast information:

- Market size by delivery mode for each year 1986-1992.
- Market growth rate for 1986-1992.
- Average annual growth rate (AAGR) for each delivery mode for the five-year period 1987-1992.

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EXHIBIT ET-1

EDUCATION AND TRAINING SEGMENT USER EXPENDITURE FORECAST BY DELIVERY MODE, 1986-1992

SEGMENTATION BY DELIVERY MODE	1986 ($M)	1986-1987 Growth	1987 ($M)	1988 ($M)	1989 ($M)	1990 ($M)	1991 ($M)	1992 ($M)	AAGR 1987-1992 (Percent)
Remote Computing/ Batch	84	11	93	104	113	119	127	132	7
Applications Software									
Mainframe/Mini	37	30	48	58	71	84	95	109	18
Micro	50	28	64	79	94	119	148	177	23
Total Applications Software	87	29	112	137	165	203	243	286	21
Turnkey Systems	137	9	149	157	168	177	183	189	5
Cross-Industry Total	308	15	354	398	446	499	553	607	11
Professional Services*	1,313	22	1,606	1,910	2,304	2,785	3,384	4,180	21

*Education and training professional services data are not included as part of the total for the education and training segment because they are included as part of the professional services segment.

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About INPUT

INPUT provides planning information, analysis and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, communications, and office products and services.

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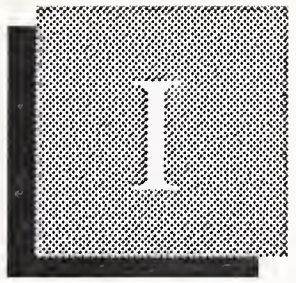
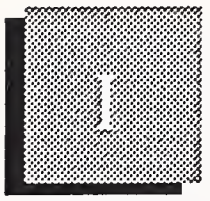


Issues, Trends, and Events



Issues, Trends, and Events

A Introduction

Computer-aided engineering, computer-aided design, and computer-aided manufacturing (CAE/CAD/CAM) is the major component of the applications that are covered in the engineering and scientific market. While the report focuses on the CAE/CAD/CAM segment of the market because it is the largest and the most dynamic, the forecasts also include scientific applications for such uses as biological research, statistical analysis, and linear programming.

CAD/CAM includes design and drafting applications and also applications such as structural analysis and structural engineering. However, for the purpose of analysis, structural analysis applications are covered in a separate section.

CAD/CAM includes a wide range of applications:

- Mechanical design and drafting that includes finite element modeling and analysis, wireframe analysis, surface design, and solids modeling.
- Electronic design that includes circuit analysis, schematic capture, schematic design-rule checking, and integrated circuit layout.
- Architecture, engineering, and construction (AEC) that includes plant design, piping design and analysis, building design and management, mapping, and site engineering.
- Computer-aided manufacturing includes robot program design and simulation, and numerical control programming.

CAD can stand for either computer-aided design or computer-aided drafting.

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- Computer-aided design involves design rule checks on drawings that have been entered. The design rule checks performed include checking for typographical errors, simple design mistakes, and for incomplete drawings. Examples include checking for spacing for parts, electrical overloads, and unspecified sizes of parts.

In addition to designing products, engineers also analyze the designs to make sure the products perform as required. Computer-aided engineering (CAE) programs fulfill this role.

Sometimes the terms CAD and CAE are used interchangeably because they are both design automation tools. However, there are important differences between the two:

- CAE systems are used at the "front-end," where products are conceived. They are used by engineers to automate the analysis and simulation of the design. In analysis and simulation, a mathematical or software model of the design is created and tested under various conditions. The results of these tests show what a physical model would do under the same conditions.

- On the other hand, CAD systems are used to draw and analyze physical structures. They are typically employed at the "tail end" of the product development process where they are used to convert engineers' designs into production drawings. The engineering and scientific market is typified by work that spans many industry segments, yet is concentrated in manufacturing, both discrete and process.

Approximately 17% the total CAE/CAD/CAM turnkey systems is included in the engineering and scientific segment forecasts. The remainder is included in the discrete manufacturing, process manufacturing, utilities, transportation, federal government, and other sectors.

- Likewise, the CAM portion is excluded from the analysis and forecasts in the engineering and scientific section. User expenditures for CAM sales are included in the discrete manufacturing industry sector.

- Expenditures by architectural and engineering firms for applications that are designed specifically for that type of firm, as opposed to an application designed for engineers or architects in any type of firm, are included in the industry-specific services sector under architectural and engineering services.

B
CAD/CAM

There are three major groups of CAD/CAM turnkey systems:

- The first is a low-cost system that sells for less than $20,000. These systems are typically dedicated to a single task such as semiconductor

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design. The IBM PC AT is the primary hardware for these products. These systems are typically limited to drafting and two-dimensional (2D) design capability.

- The second group of systems have more than one graphics workstation linked together in a cluster. Such systems begin at around $100,000 and are suited to the needs of medium-sized firms with complex design needs.

- The third group of CAD/CAM systems comprises of the largest and most expensive equipment. These systems allow many designers to work on different portions of one project by using separate workstations that are connected to the central computer that updates and coordinates the whole design process. The high end of the market is growing at a slower rate than the other two groups.

The CAD/CAM market is characterized by the influx of microcomputer-based products into what had previously been a minicomputer and mainframe dominated market. PC CAD software has become a commodity product. PC-based systems have hurt sales of the high-end systems.

In addition to the move toward PC-based systems, the major trends in the CAD/CAM industry are the following:

- Move toward open architecture or industry-standard platforms.

- Emergence of systems to integrate mechanical design, engineering, and shop floor manufacturing systems.

- Integration of data management and computing systems. An effective data base management environment is necessary for the integration of a multi-vendor information system.

- Communications across disparate workstations and computer systems from multiple vendors. In order to address these communication problems, CAE/CAD/CAM vendors are making major shifts in their workstation offerings toward systems based on emerging industry standards.

- Distribution solutions in a hierarchical setting. The promise of a hierarchy of computing systems is that data management and archiving functions are performed at the host level and the interactive data management and design applications at the workstation level.

- Back-end processors at the departmental level.

- Move toward solids modeling and three-dimensional (3D) capabilities.

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- Introduction of more intelligence through the incorporation of expert systems.

- Greater involvement of senior management in the decision to buy a system. CAD/CAM systems have become capital-expenditure items, thus requiring the approval of senior management. This lengthens the sales cycle.

- Move toward component CAD/CAM systems. Companies that already have computers installed are reluctant to buy integrated CAD/CAM systems that may duplicate what they already own. Instead, they are likely to want separate CAD/CAM components such as software and graphics workstations that they can connect to their existing hardware.

Vendors of CAD/CAM systems are focusing on front-end and back-end design applications since the drafting function of CAD has become a commodity product. As a result, vendors are placing increased emphasis upon integrating formerly disparate applications.

Turnkey CAD vendors are facing increasing pressure to unbundle software giving users even more choices in assembling their systems. Traditional companies will find it difficult to keep up their revenue streams.

A recent development has been the appearance of consulting centers designed to help CAD users do their own integration. These centers provide users with the guidance, training, and consulting needed to get their systems up and running.

C

CAE in Electronics Industry

The need for CAE tools in electronic design resulted from the increasing complexity of large-scale integrated circuits and the electronic systems incorporating such components. This increasing design complexity has significantly lengthened the product development cycle while, at the same time, more competition in the electronics industry has shortened product life cycles.

- The primary user benefits of CAD/CAM/CAE systems are in producing products less expensively and, more importantly, developing them faster to take advantage of market windows.

- CAE is used to improve the quality of design by simulating operational performance and by reducing the turnaround time for various phases of electronics engineering, including defining overall system architecture, logic circuit layout, design-rule checking, and timing simulation.

- This implies that there will have to be significant links between the design function and the production function, and post-production issues such as product testing and field service. Engineers want the design to

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go smoothly from CAD to CAE and then to CAM in a fully integrated system.

There are about 3,000 chip designers in the world compared with about 400,000 systems designers. The integrated circuit designers were the initial purchasers of CAE tools. The trend is toward system design rather than chip design. CAE tools will be more gradually adopted by systems designers which will be accompanied by evolutionary changes in the characteristics of CAE tools and suppliers. Systems designers will require tools that are easier to learn and use and which address a broader range of electronic design applications. It takes a long time, even for a sophisticated IC designer, to learn how to use the current systems.

A key issue facing CAE vendors now is data management, that is, the ability to move data through a particular vendor's system as well as the ability to transfer data from one vendor's system to another. However, because of the sheer volume of data and the assortment of formats used, data management presents a formidable challenge to the industry.

Currently, three companies dominate the CAE tools marketplace: Mentor Graphics, Daisy Systems, and Valid Logic Systems. The market forces facing these three leading CAE vendors are:

- Customers are demanding easier-to-use systems that cost less.
- Start-up companies are offering PC-based systems.
- Established instrument, CAD/CAM, and computer companies are suddenly attracted to the CAE market.

Vendors that have either entered or have announced their intention of entering the CAE market include:

- Tektronix, a leading instrumentation company, who acquired CAE Systems, Inc. of Sunnyvale, California.
- Hewlett-Packard, which has floundered in its attempts to develop CAE software, purchased a CAE software company—Cericor Inc. of Salt Lake City, Utah.
- The CAD/CAM companies, led by Computervision, Intergraph, General Electric's Calma subsidiary, and Schlumberger's Applicon division, have already begun encroaching on the CAE market.
- AT&T and IBM, with their own advanced internal CAE tools, could each be a major force in the market.

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However, all has not gone well for these new entrants.

- Companies like Hewlett-Packard and Tektronix have barely gained a toehold in CAE.

- The established CAD vendors have had trouble moving into CAE as well. Both Computervision and Calma bought small CAE startups to help them move into chip design systems, but marketing and technical problems have hampered their product introductions.

It takes a major investment of both time and resources to successfully penetrate this market. The software involved is very complex and, as H-P and Tektronix have discovered, more difficult and time consuming than anticipated. One cannot rush into the market with a CAE application.

- In addition, an ever increasing number of product features are required to enter this market. Additional features that have been added recently to CAE systems include PCB layout, ATE (automatic test equipment) interfaces, silicon compilation, and standard cell layout.

- The newer CAE products integrate the once independent functions of design, design verification, layout, and test generation, thereby easing the bottlenecks in the design-to-production process.

D

Structural Analysis

Structural analysis and modeling is of interest to a diverse range of customer segments, including the aerospace, automotive, and civil engineering industries. In general, engineering analysis involves the detailed simulation of structural behavior under a variety of operating conditions.

Typically, such analysis involves the use of "finite element modeling" (FEM) techniques for solutions. Finite element analysis, the most widely used of the structural engineering techniques, divides the structural unit being modeled into a discrete number of well-defined elements—the finite elements. These elements are assumed to be connected to each other in simple geometric shapes that individually lend themselves to analysis. The geometric shapes are then added together to form the essential structure of the object. Using this technique, the behavior of complex shapes, such as an airplane wing or an automobile fender, can be studied.

The commonality and generic appeal of FEM techniques applied to diverse applications had led to the development of industry standard software packages, such as ANSYS, NASTRAN, PATRAN, and STRUDL.

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- The most popular FEM software is MacNeal-Schwendler Corporation's MSC/NASTRAN, a continuously enhanced version of the original NASA structural analysis program currently licensed for a monthly fee to over 300 customers in aerospace, defense, energy, construction, and consumer products industries. The full-scale program is available from most RCS vendors that support engineering and can be leased by a corporation for use on its own mainframe or minicomputer.

- Dozens of other structural simulation packages are available either in the public domain or for a fee from third parties, generally designed to aid in problem solving applicable to specific disciplines of engineering analysis.

The STRUctural Design Language (STRUDL) is an outgrowth of work done on computerized engineering techniques at MIT in the 1950s and 1960s. The early programs were in the public domain. Several software and RCS vendors have used this code as the basis of their own proprietary offerings. Proprietary STRUDLs offer greatly enhanced capability for analyzing complex structures under a wide variety of conditions. These packages feature automatic model generation, graphics model verification, automatic load generation, complete building code compliance, and member (element) redesign.

E

Workstations

Today's workstation environment is marked by high-speed color graphics and the ability to run complex programs, making intense use of local CPU resources, while tapping shared resources via networking.

1987 marks a turning point with prices of workstations declining to affordable levels for many users. The low-cost workstations will dominate the market in terms of units sold.

Agreement among vendors, in the form of widely accepted standards, particularly in the area of window management, has spurred applications development by independent software vendors. A standard provides a stable framework within which new products can be developed with some assurance of being transportable to other environments.

There will be four major CAE/CAD/CAM workstation platforms accepted over the next few years:

- Unix workstation (Apollo, Sun, etc.)
- DEC MicroVAX family
- IBM PC family (PC AT compatible, PS/2 series)
- IBM workstation family (RT PC)

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F
Silicon Compilers

One new technology with a great deal of promise that has so far failed to take off in the market is silicon compilers. A silicon compiler is a computer program that automatically designs a chip based on engineering descriptions of what the circuit should do. These compilers go beyond the capabilities offered by present CAE systems by actually doing the design of the chip. Despite much promise, the market for silicon compilers has not grown as quickly as expected.

Silicon compilers began appearing in late 1984. Today, they are sold mainly by three small, private companies: Silicon Compilers Inc. (San Jose, CA); Seattle Silicon Technology (Bellevue, WA); and Silicon Design Labs (Liberty Corner, NJ).

One established semiconductor company, LSI Logic, has recently entered the market with a silicon compiler based on a different concept. Rather than accepting the compromises in design that current products trying to automate the design of all types of chips are forced to make, LSI is developing a different compiler for each of the dozen or so major types of chips.

The reasons this market has failed to take off at this point are:

- The electronics companies, their primary customers, have just begun to recover from a two year slump.

- While silicon compilers can do the design job faster than an engineer, they still do not do as good a job. Computer-designed chips waste more space on the silicon, making such chips more expensive to manufacture.

- However, silicon compilers have a bright future. Because chips are becoming so complex, engineers can no longer do the design without the aid of a computer. There must be a way for a designer to deal with all of the intricacies of a complex integrated circuit, and silicon compilers offer one the few, if not only, available solutions.

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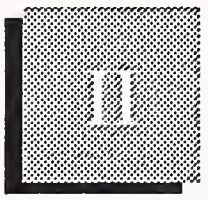
III

Market Forecasts



Market Forecasts

The four largest markets for CAD systems are:

- Mechanical design—this is the largest area, encompassing the aerospace and automobile industries.

- Integrated and printed circuit board design—this primarily includes the electronics companies.

- Civil engineering—this includes the construction industry. The primary use is for piping design and layout. Key users are oil and chemical companies and construction contractors that design and build refineries and chemical plants.

- Mapping—this is used primarily by local and federal government agencies for municipal planning and public utility mapping. Natural resource firms are using CAD techniques for mapping seismic data on mineral deposits.

The largest market for CAE is for electronics design, particularly for integrated circuit design.

User expenditures for cross-industry engineering and scientific applications will grow 14% annually through 1992, increasing from $911 million in 1987 to $1.8 billion in 1992, as shown in Exhibit II-1.

One promising area is remote computing services based on a supercomputer. Supercomputer processing services, such as Control Data Corporation's Cybernet service, provide the processing capabilities necessary for a number of applications such as wind tunnel simulation.

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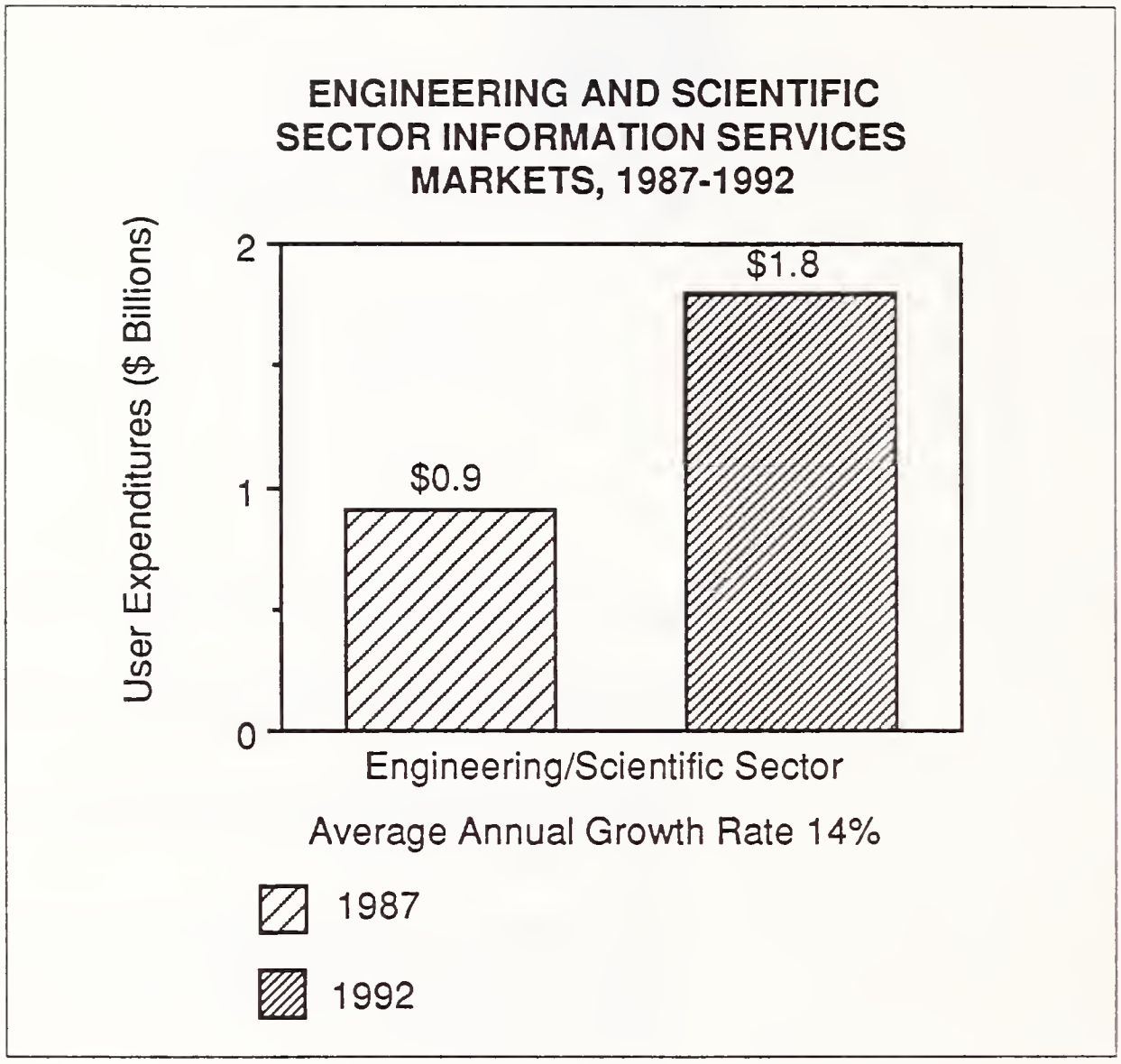
EXHIBIT II-1



Forecasts for user expenditures by delivery mode are shown in Exhibit II-2. Application software user expenditures will grow most rapidly at a rate of 25% as firms buy engineering/scientific software for their in-house computer systems. Appendix ES-A contains the forecast data base for each year, 1986-1992, by delivery mode.

The CAE/CAD/CAM industry is in a transition from the rapid growth of the early eighties to a period of slower expansion. The reasons for the slowdown in growth include the following:

- The initial period of rapid growth has slowed as the "early adopter" phase has run its course and vendors face a more difficult task of selling to a new level of customers. Unlike the early days of CAD/CAM, companies want their systems to fit into their overall corporate plans for automation.

- CAE/CAD/CAM systems are now considered as capital expenditure items. Purchases require senior management approval and as a result long purchase cycles. The capital spending slowdown in recent years depresses the market for CAE/CAD/CAM systems.

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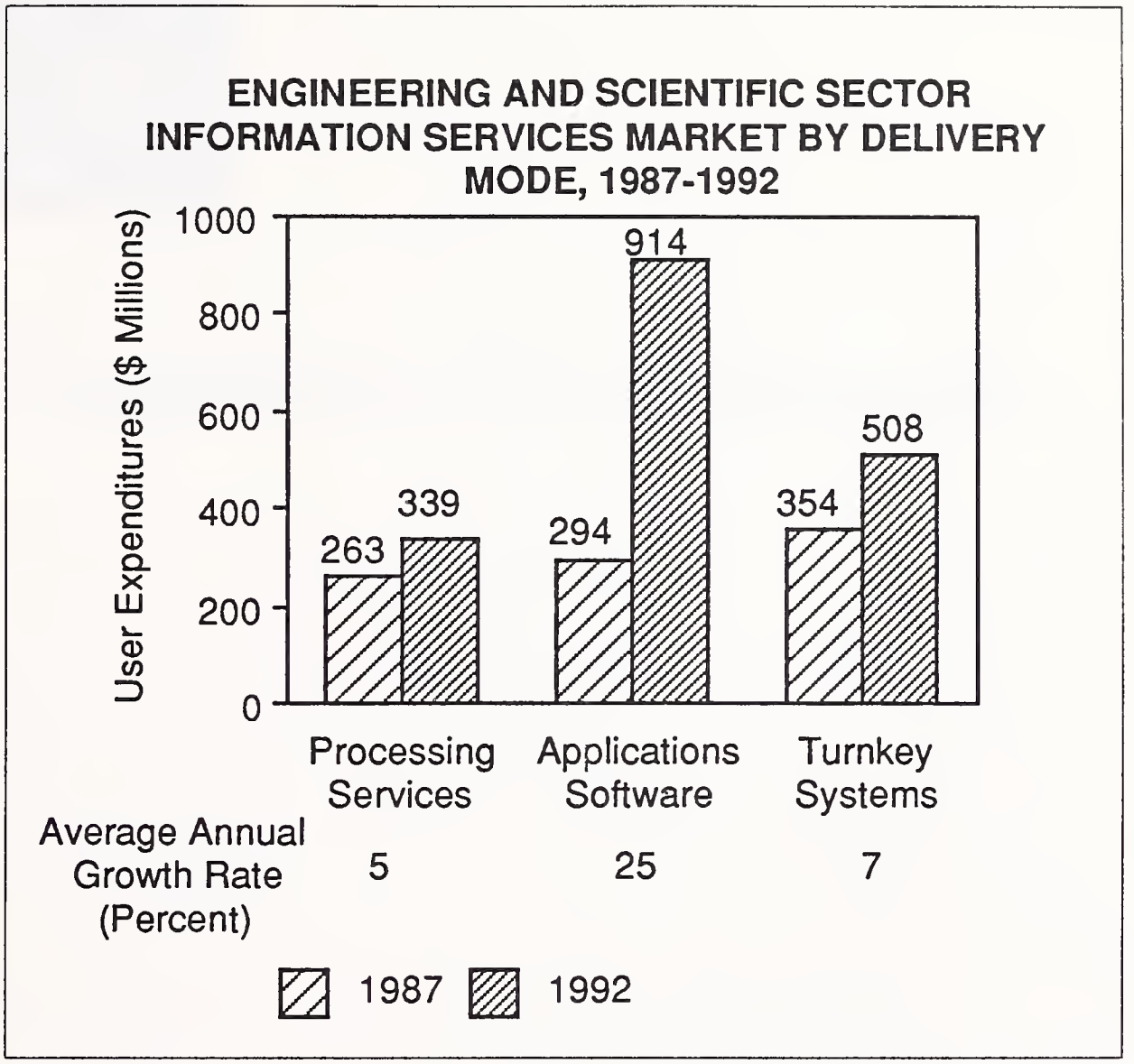
EXHIBIT II-2



- There has been a huge price erosion in the marketplace. Consequently, the dollar values do not provide an accurate picture of the industry. While industry growth is not significant in dollar terms, unit volumes have soared.

- The intense competition in the industry, particularly among the work-station manufacturers has led to "lower-than-anticipated" prices.

More rapid growth in the CAE/CAD/CAM industry will come from low-end systems where PC-based systems are proving to be an increasingly popular choice. PC-based CAD software such as two-dimensional drafting software are becoming commodity products. The CAE segment is a promising market due to the advent of low-cost entry level CAE workstations and the low penetration of the overall market.

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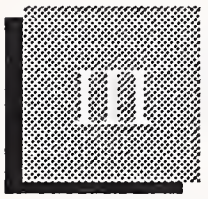
III

Competitive Developments



Competitive Developments

A Introduction

The engineering and scientific marketplace is characterized by new product introductions and extreme price competition to the benefit of end users.

With the introduction of the Macintosh II, Apple has the opportunity to capture a share of the low-end market.

IBM's introduction of the Personal System/2 series of personal computers has signified the emergence of a new front in the workstation arena. These computers offer good graphics, considerable processing power, and large memories.

1987 marks a turning point with workstations available at affordable prices. With prices dropping into the $5,000 range, workstations appear to be on a collision course with PC-based systems. Further price-cutting and MIPS one-upmanship between Sun, Apollo, and DEC promises to put affordable systems within the reach of more users. While Apollo and Sun are the leaders in the workstation market, they will have to contend with increasing competition from the major computer companies, DEC, Hewlett-Packard, and IBM. As customers look for integrated systems and vendor stability, the major computer companies are likely to be the beneficiaries.

DEC has changed its pricing policies to the disadvantage of its OEMs, including turnkey vendors. The company has revised its discount rates and made them the same for OEMs and volume end users. This makes it easier for some users to buy the hardware from DEC and "unbundled" software from a CAE/CAD/CAM vendor.

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B

Vendor Profiles

1. APPLICON (4251 Plymouth Road, Ann Arbor, Michigan 48106)

a. Products/Services

Applicon, an operating unit of Schlumberger Limited, offers turnkey systems for CAE/CAD/CAM/CIM applications. The company's major product offering Bravo3 is based on a broad range of integrated applications with a common user interface.

b. Markets Served

Applicon offers computer-aided tools to industries whose products are mechanical, electronic or a combination of both. These industries include semiconductors, consumer products, defense, automotive, aerospace, and metals.

c. Company Strategy

Rather than compete head-on with IBM, Intergraph, and Computervision at large accounts, Applicon has repositioned itself to focus on small and medium companies.

d. Recent Activities

In March 1987, Applicon announced several new products:

- Bravo3 Facilities software package for the graphic layout of facilities, equipment, and utilities for manufacturing plants.
- Bravo3 Tech Doc technical documentation software integrates graphics and text and produces camera-ready typeset quality documents.
- Design Review software, an easy-to-use application for viewing graphics data.
- Graphics Workstation GW4790, a high performance graphics workstation.
- Applicon also announced lower prices and unbundling of all Bravo3 software.

e. Future Directions

Applicon anticipates that electronics customers will account for 25% of its sales by 1988; they now represent less than 15% of revenues.

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2. AUTO-TROL TECHNOLOGY CORPORATION (12500 North Washington Street, Denver, Colorado 80233)
Revenue (FYE 12/31/86): $62.4 million

a. Products/Services

Auto-trol manufactures and markets turnkey CAD/CAM systems. Auto-trol's systems integrate hardware, proprietary graphics software, and applications software. The hardware components of Auto-trol systems include the Advanced Graphics Workstation (AGW), the Advanced Raster Workstation (ARW), and the Advanced Personal Workstation (APW).

Graphics and applications software include Auto-trol Series 5000 Advanced Graphics software and Auto-trol Series 7000 Advanced Graphics software.

b. Markets Served

Auto-trol's primary markets are the architecture, engineering and construction, mechanical design and manufacturing, and technical publication industries.

c. Recent Activities

In April 1987, Auto-trol announced the availability of a publishing system interface based on PostScript, a page description language from Adobe Systems. The interface will offer technical illustrators the ability to address PostScript compatible imaging devices for proofing and final production of illustrations and presentation graphics.

In November 1986, Auto-trol announced a number of new products:

- Engineering Information Management System (EIMS), a project-oriented job accounting and file management system for the control and maintenance of CAD-based engineering data.
- Interactive Nesting System to enhance the automation of a manufacturing process.
- Empress/32, a general-purpose relational data base management system for use within engineering environments.
- Facility Layout, an addition to its family of products for Industrial Plant Design.

In addition to the above-mentioned new products, Auto-trol announced a joint marketing agreement with CIMCO/AIS (Austin, TX) for the sale of

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the latter's hardware and software for Direct Numerical Control (DNC) systems. Auto-trol also entered into an OEM agreement with Interleaf, Inc. (Cambridge, MA) acquiring the distribution rights for the Interleaf Workstation Publishing Software.

3. Computervision Corporation (100 Crosby Drive, Bedford, Massachusetts 01730)
Revenue (FYE 12/31/86): $494.7 million

a. Products/Services

Computervision offers turnkey CAD/CAM/CAE systems based on proprietary hardware as well as systems based on hardware from IBM, DEC, Prime and Sun Microsystems. The company has developed several integrated lines of CAD/CAM systems marketed under the names CADDStation, CDS 4000, Designer, Medusa, and Personal Systems. Computervision's best-selling product line is its CADDStation. CADDStation has emerged as the company's bread-and-butter product replacing the CDS 4000 series.

b. Markets Served

The company primarily serves five major industry groups: automotive, aerospace, mechanical machinery, electrical/electronic, and architecture/engineering/construction.

c. Company Strategy

In 1986 Computervision began a financial turnaround. The company became profitable after incurring losses for six quarters. Although the year ended with a loss, the last two quarters of 1986 were profitable. This trend continued into the first half of 1987.

Computervision's difficulties reflected difficulties in its product line that was based on proprietary hardware. With the introduction of CADDStation, Computervision has successfully ported its software to industry-standard hardware. Introduced in April 1986, CADDStation is a workstation based on 32-bit hardware technology from Sun Microsystems, the Unix operating system and the Ethernet local area network.

d. Recent Activities

In June 1987 Computervision announced that it had ported its Medusa CAD software to the Sun Microsystems platform.

In July 1987 Computervision announced the CADDStation 34, a graphics workstation featuring Sun's version of the Unix operating system.

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In August 1987, Computervision introduced TechPubs II, software packages designed to help users of its CADDStation family of 32-bit engineering workstations document their work.

e. Future Directions

The company plans to shift its emphasis from hardware to software.

Computervision plans to focus its research and development efforts in the areas of mechanical CAE, artificial intelligence, solid modeling, precise surface modeling, numerical control and computer-aided manufacturing applications, and advanced electronics design.

4. CONTROL DATA CORPORATION (8100 34th Avenue South, Minneapolis, Minnesota 55440)

a. Products/Services

Control Data's Computer Systems and Services Division designs, manufactures, and markets Control Data's CYBER line of computer systems. In the area of CAE/CAD/CAM Control Data specializes in CIM (computer-integrated manufacturing), that forms part of the Computer Systems and Services division. The company's principal CIM product line is its ICEM, Integrated Computer-Aided Engineering and Manufacturing. ICEM products integrate CAD/CAM activities under a single computerized design management and control system. The ICEM software runs on Control Data's CYBER 910 series of Unix-based integrated workstations.

b. Markets Served

Control Data's customers are primarily in the scientific and engineering computing environments, such as CAE and integrated manufacturing, utility, education, and petroleum industries.

c. Company Strategy

The company focuses on integrated solutions as it believes that its integration capabilities is its major strength.

d. Recent Activities

In July 1987, Control Data introduced the ICEM plus that provided major enhancements to its graphics workstations and software.

Also in July 1987, Control Data expanded the CYBER 190 family by introducing four high-performance 3-D graphics workstations.

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e. Future Directions

Control Data is moving from engineering applications into combining engineering and manufacturing for an integrated manufacturing approach.

5. DAISY SYSTEMS CORP. (700 Middlefield Road, Mountain View, California 94039)
Revenue (FYE 9/30/87): $100.9 million

a. Product/Services

Daisy Systems designs, manufactures, and markets turnkey CAE systems to automate the electronic design engineering process. Its tools are used for the design and layout of application-specific integrated circuits (ASICs), printed circuit boards (PCBs), and integrated circuits (ICs).

b. Markets Served

Daisy's products are primarily used by the military/aerospace, semiconductor, telecommunications, and computer industries.

c. Company Strategy

In 1986 Daisy created the Customer Support Division combining the training, technical publications, field service, and customer hot-line operations into one division. The creation of this division is part of Daisy's efforts in improving its customer service.

Once considered a star performer and a pioneer in the CAE workstation market Daisy has fallen far and fast. The company's problems resulted from its decision to use a proprietary system. The company has since embarked on a strategy of developing systems based on industry-standard hardware.

d. Recent Activities

The company is continuing its efforts to implement the transition to industry-standard platforms. In March 1987, Daisy introduced a line of CAE workstations based on Intel's microprocessors (80286 and 80386) and EGA graphics standards. The workstations are called the Personal Logician 286, Personal Logician 386, and Logician 386. In the mid-range Daisy is considering the Sun Microsystems Sun-3 and Sun-4 as platforms.

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e. Future Directions

It will take about a year for Daisy to offer CAE systems based on a broad line of industry-standard hardware including IBM, DEC, and Sun. Daisy has the resources (cash reserves: $75 million in August '87) to achieve its objectives.

The company plans to increase its emphasis on improving and formalizing procedures, particularly in the manufacturing, quality control, and project management areas.

6. INTERGRAPH CORPORATION (One Madison Industrial Park, Huntsville, Alabama 35807)
Revenue (FYE 12/31/86): $605.7 million

a. Products/Services

Intergraph designs, develops, and markets turnkey CAD/CAM/CAE interactive graphics and data base management systems. The company's systems are based on the DEC VAX line of minicomputers and on a proprietary series of engineering workstations.

b. Markets Served

Intergraph's systems are used in mechanical and electronics CAD/CAM; architecture, engineering, and construction (AEC); mapping and earth sciences; energy exploration, utilities, and electronic publishing industries.

c. Company Strategy

Faced with declining demand for large turnkey systems Intergraph has implemented bold changes during the past few years. The company has placed increased emphasis on workstation products and has shifted its focus to its hardware capabilities. In 1986 Intergraph made a strategic decision in developing its own workstation. The company's decision to develop its own hardware was based on its being a large DEC OEM and the inevitable tension resulting from the two companies becoming competitors in the marketplace. (DEC's corporate direction has changed as the company moves into the end-user market, while reducing its dependence on OEM sales.)

d. Recent Activities

In 1986 Intergraph announced the InterPro 32C, a workstation based on the Clipper Microprocessor (developed by Fairchild Semiconductor) and the Unix operating system. With this hardware, Intergraph entered the

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generic stand-alone workstation market and thus competing with Apollo, Sun, and DEC. The company hopes to see the system accepted as a general-purpose workstation and plans to pursue OEMs.

In January 1987, Intergraph acquired a 50% interest in Bentley Systems (Lionville, PA), a computer graphics software development company.

In September 1987, Intergraph purchased Fairchild Semiconductor's clipper operations (Advanced Processor Division) from National Semiconductor. (National Semiconductor had acquired Fairchild Semiconductor.) Intergraph plans to continue to sell the clipper on the open market.

e. Future Directions

Intergraph is promoting the concept of distributed processing for design applications.

7. THE MACNEAL-SCHWENDLER CORPORATION (815 Colorado Boulevard, Los Angeles, California 90041)
Revenue (FYE 1/31/87): $27.1 million

a. Products/Services

MacNeal-Schwendler markets computer software products for mechanical CAE applications. The company's principal product is MSC/NASTRAN, a computer program used by designers and engineers to analyze the strength characteristics of structures or products prior to construction or manufacture. MacNeal-Schwendler also offers a complete line of mechanical CAE products for personal computers. According to the company, MSC/NASTRAN is the most widely used finite element analysis program in the world.

b. Markets Served

The company's products are used in the aerospace industry and other industries including automotive, ship building, industrial and office equipment, nuclear, petrochemical, and architecture and engineering.

c. Company Strategy

MacNeal-Schwendler plans to build on its success as a leader in finite element analysis.

d. Recent Activities

In January 1987, MacNeal-Schwendler began shipping MSC/pal, a finite element analysis software product for the Macintosh.

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In March 1987, MacNeal-Schwendler announced that it had agreed to develop a new version of its MSC/NASTRAN program for Alliant Computer Systems' FX/Series of minicomputers. (Alliant Computer Systems is based in Littleton, MA.)

Also, in March 1987, MacNeal-Schwendler introduced ADCAD2 Version 2, software that enables users of popular PC-based CAD programs to easily transfer drawing files to and from MSC/pal 2, the company's finite element analysis program for minicomputers.

In June 1987, the company introduced a version of its MSC/pal 2 software for the IBM PS/2 series of personal computers.

e. Future Directions

The company plans to expand its software product line for personal computers.

8. MENTOR GRAPHICS CORPORATION (8500 Southwest Creekside Place, Beaverton, Oregon 97005)
Revenue (FYE 12/31/86): $173.5 million

a. Products/Services

Mentor Graphics designs, develops, manufactures, and markets turnkey CAE systems for use in the design, analysis, physical layout, and testing of integrated circuits and electronic systems. Mentor markets its data base and applications software on engineering workstations supplied by Apollo. The company's principal product line is the IDEA Series of engineering workstations. Mentor also offers CAE software products for personal computers.

b. Markets Served

Mentor markets its products to customers in the aerospace, computer, telecommunications, semiconductor, and consumer electronics industries.

c. Company Strategy

Mentor has emerged as the leading vendor in the CAE field. Mentor's strategy in developing systems based on industry-standard hardware seems to have paid off. The company has no immediate plans of developing applications for multiple platforms. Mentor claims that "its customers are concerned not as much with the underlying computer platform as they are with the depth and breadth of the software applications that run on it."

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d. Recent Activities

In June 1987, Mentor introduced the Domain Series 4000 Workstation, a series of products for electronic computer aided design. The systems based on Apollo workstations are available under the names Idea Station for schematic capture and local simulation, Chip Station for custom VLSI (very large-scale integration) circuit design and layout, and Board Station for printed circuit board design.

e. Future Directions

Mentor hopes to stay ahead by moving beyond CAE to diversify into related fields that are part of the automated design market. These areas include CAD, publishing, packaging and software engineering. One niche that Mentor is focusing on is design for printed circuit boards.

9. TEKTRONIX, INC. (P.O. Box 500, Beaverton, Oregon 97077) Revenue (FYE 5/31/87): $1,395.9 million

a. Products/Services

Tektronix offers test and measurement instruments, display products, and communications products. The company's Design Automation Group focuses primarily on the design, simulation, verification, and analysis of digital integrated circuits systems and subsystems generally associated with computer technology. The products include CAE, computer-aided software engineering (CASE) products, microcomputer development products, logic analyzers, and semiconductor test systems. Tektronix CAE systems facilitate transfer of design data from schematic capture and design verification through layout, fabrication, and final testing for printed circuit board (PCB) and application-specific integrated circuit (ASIC) design.

b. Markets Served

Tektronix's customers are in the electronics, communication, computer, government, and education industries.

c. Company Strategy

Tektronix's approach to CAE is to provide integrated design, evaluation, and testing for electronic systems development.

d. Recent Activities

In fiscal 1987, Tektronix introduced over 60 new products including oscilloscopes and a new series of graphics terminals.

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e. Future Directions

Tektronix will continue to take advantage of its four-decade experience in test equipments. The major challenge facing Tektronix is tying together its instrument-type products into the CAE area.

10. VALID LOGIC SOLUTIONS INC. (2820 Orchard Parkway, San Jose, California 95134)
Revenue (FYE 12/31/86): $60.9 million

a. Products/Services

Valid Logic designs, manufactures, and markets turnkey CAE applications for electronic systems design and integrated circuits design.

b. Markets Served

The market for Valid's products includes two groups of electrical engineers; systems engineers and integrated circuit designers. Valid has sold its systems to customers in the computer, semiconductor, telecommunications, instrumentation, and aerospace and military industries.

c. Company Strategy

Valid's strategy lies in integrating the operations of Valid and Telesis to realize the maximum synergies possible (Valid acquired Telesis - See "Recent Activities."). Valid plans to develop applications for Sun workstations while Telesis plans to develop applications for the DEC MicroVAX. Historically Valid has used DEC hardware and Telesis has run on Sun workstations.

d. Recent Activities

In February 1987, Valid acquired Telesis Systems Corp. (Chelmsford, MA), another player in the CAE industry. Telesis develops and markets electronic design automation workstations used for printed circuit board design.

In June 1987 Valid introduced two new products, ValidCOMPOSE and Allegro. ValidCOMPOSE is an integrated circuit design tool for developing chip architectures. Allegro is a rules-driven printed circuit board design system.

Also in June 1987, Valid ported its electronic design automation tools to Sun's Unix-based workstations.

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e. Future Directions

In the interview with Electronic Business (June 15, 1987) Douglas Hajjar, president and CEO of Valid (formerly president and CEO of Telesis) stated, "There's no doubt that in the near future a company that has a Unix-based Sun platform and a MicroVAX-based platform with IBM PCs in the front end, all running full CAE and PCB capability with software links into manufacturing and testing - there is nobody in the marketplace today that can touch that kind of company. And that's exactly what we will have in a very short period of time."

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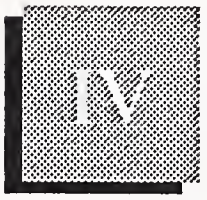
New Opportunities



New Opportunities

A CAD/CAM

There are three major areas of opportunity in the CAD/CAM market: three-dimensional capabilities, integration, and solids modeling.

Three-dimensional modeling and design represents a significant opportunity. These capabilities are needed in the mechanical, electrical, and chemical fields. Applications include: three-dimensional mechanical design, fluid and air flow, and modeling of molecules in three dimensions.

The next major opportunity in the market is the emergence of genuine integration of CAD and CAM, and in linkages between CAE and computer-aided testing, developments that promise to compress the process of design, testing, and manufacture.

- Integration is important because it streamlines the product development cycle. A circuit board, for examples, evolves from a schematic design into a layout of physical parts and is then rendered as an assembly drawing and transferred to manufacturing. At the same time, the board's mechanical housing must be designed and fitted. With an integrated data base, this activity becomes a single flow of information since all of these functions share a common data base. Thus, engineers at each step can work from the same model, speeding the communication of design progress and automatically ensuring parts accuracy and compatibility.

- Costly R&D efforts will be required to succeed in developing and bringing such products to market.

Solid modeling software is an emerging application that is expected to dominate design applications by the end of the decade. In the past, the computing power needed for solid modeling was often prohibitive, but as

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hardware prices declined and processing power increased, this allowed the capabilities of solid modeling to be available to more engineers. Solid modeling software enables designers to describe the volume and mass of mechanical parts on the computer—a considerable improvement over the edges and corners provided by other kinds of CAD software.

B

CAE

The opportunities in the CAE market revolve around price, improved data management, and performance.

- A drawback to CAE systems is price. What is needed are systems in the $10,000-20,000 price range with the same performance and functionality as the systems that average about $50,000. This will bring the systems into a price range that many more engineers can afford. There appears to be a threshold at about $20,000 where large companies to think of buying a workstation for every engineer. Currently, engineering workstations are typically shared by a number of engineers.

- One of the problems associated with CAE systems is the lack of sophisticated data management. Most CAE systems have only limited facilities for relating information files. Once a hierarchical DBMS can be integrated into a CAE workstation, the designer will be relieved of much routine work, with a key benefit being the ability to do modular design.

- Another need by chip designers is for faster circuit simulation.

C

Workstations

New opportunities in the workstation market lie in the commercial sector such as banking and finance. As an example, Sun has introduced a workstation for financial applications for stock brokerages and other investment banking companies.

D

Other

The following are emerging research areas that will need software packages:

- Biochemistry.
- Combined chemical and structural engineering.
- Cryogenic and space related research.
- Graphics for biology.
- Hydrology.
- Linkage between automated design and machine tool control.
- On-line simulation of biological and chemical processes.
- Parametric design for a family of products.
- Process synthesis.
- Strategic Defense Initiative ("Star Wars").
- Rock stability.

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In addition, other applications that are needed include:

- Drilling simulation for underground modeling.
- Improved laboratory management systems.

Demand for computerized design and simulation tools will increase in biological and genetic engineering as new technical advances increase the complexity of these fields.

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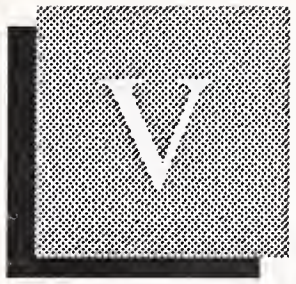
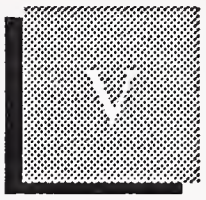


Conclusions and Recommendations



Conclusions and Recommendations

Rapid technological advances will continue to characterize the CAD/CAM/CAE industry and competition will continue to be intense.

Communications are key to creating a productive system whether a company is trying to share data among its various types of workstations, pass data to a remote location, or tie into a corporate data base.

The winners in the turnkey market will be those vendors that offer products in the form of an open architecture with independent workstations ranging in power and capability that can all be hooked up to a common data base.

In the future, current capabilities offered on workstations will be available on PCs. The implications of this are lower prices, greater unit sales, and potentially declining revenues for some vendors. However, the offering of greater capabilities on lower priced systems will serve to overcome a threshold level in the market by opening up the market to new users and new applications.

To address the needs of the environment, a company should offer a hierarchy of solutions. A vendor should provide an entire spectrum of solutions that all work with a consistent user interface.

Offering an inexpensive two-dimensional product on a PC will provide the vendor with the opportunity to sell the customer a more expensive three-dimensional product when the customer outgrows two-dimensional.

The cost of entry into the market for sophisticated engineering programs such as NASTRAN is substantial and will limit the introduction of new competitive products.

The CAD/CAM market will eventually develop into a data base battle, giving IBM the advantage over other CAD/CAM vendors. This will

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occur when the CAD capabilities become a commodity and the data base consequently takes on greater importance.

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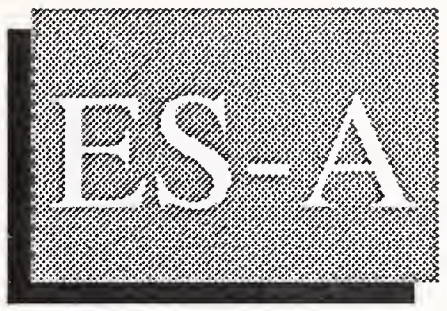
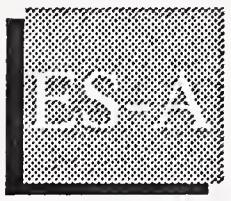


Appendix: Forecast Data Base



Appendix: Forecast Data Base

This appendix contains the following forecast information, as shown in Exhibit ES-A-1.

- Market size by delivery mode for each year, 1986-1992.
- Market growth rates for 1986-1987.
- Average annual growth rate (AAGR) for each delivery mode for the five-year period 1987-1992.

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EXHIBIT ES-A-1

ENGINEERING AND SCIENTIFIC USER EXPENITURE FORECAST BY DELIVERY MODE, 1986-1992

Segmentation by Delivery Mode	($M) 1986	1986-1987 Growth (Percent)	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	($M) 1992	1987-1992 AAGR (Percent)
Remote Computing/Batch	247	6	263	281	297	309	327	339	5
Application Software									
- Mainframe/Mini	186	28	239	306	388	480	589	713	24
- Micro	42	31	55	73	95	126	162	201	30
Total Application Software	228	29	294	379	483	606	751	914	25
Turnkey Systems	322	10	354	380	418	451	479	508	7
Cross-Industry Total	797	14	911	1040	1198	1366	1557	1761	14

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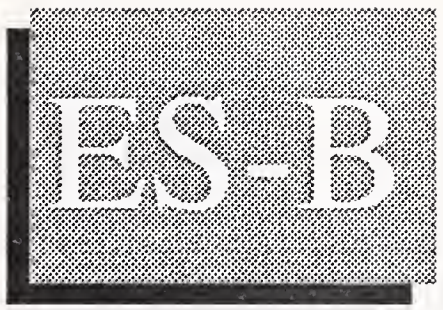
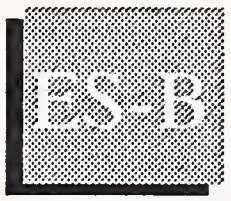


Appendix: Forecast Reconciliation



Appendix: Forecast Reconciliation

This appendix contains the following information:

- Exhibit ES-B-1 which indicates the changes made in this year's forecast as compared to last year's.
- An explanation of any significant changes that were made to the forecasts.

INPUT has reduced the five-year growth rate (AAGR) for turnkey systems from 15.1% to 7.1%. There is intense price competition among the major hardware vendors, Sun, Apollo, and DEC. Also, the marketplace is witnessing a trend away from turnkey systems and toward industry-standard hardware and "unbundled" software.

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EXHIBIT ES-B-1

ENGINEERING/SCIENTIFIC SEGMENT - DATA BASE RECON-

Delivery Mode	1986 Market		
	1986 Forecast ($M)	1987 Report ($M)	Variance of 1987 Report (Percent)
Remote Computing/Batch Serv.	263	247	6
Application Software			
- Mainframe/Mini	186	186	0
- Micro	42	42	0
Total Application Software	228	228	0
Turnkey Systems	322	322	0
Cross-Industry Segment Total	813	797	2

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EXHIBIT ES-B-1 (Cont.)

CILIATION OF MARKET FORECAST BY DELIVERY MODE

1991 Market			1986-1991 AAGR Forecast in 1986 Report (Percent)	1987-1992 AAGR Forecast in 1987 Report (Percent)
1986 Forecast ($M)	1987 Forecast ($M)	Variance of 1987 Forecast (Percent)		
335	327	2	5	5
545	589	-7	24	24
162	162	0	31	30
707	751	-6	25	25
648	479	35	15	7
1690	1761	-4	16	14

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INPUT provides planning information, analysis and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, communications, and office products and services.

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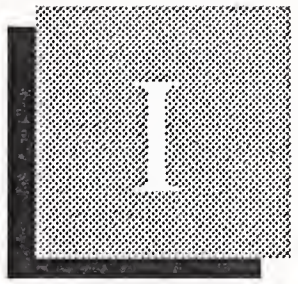

Issues, Trends, and Events

I

Issues, Trends, and Events

A

Introduction

The cross-industry segment human resources consists of payroll, personnel, and human resource management systems.

Companies specializing in payroll services such as Automatic Data Processing (Roseland, NJ) and Paychex (Rochester, NY) are referred to as "service companies." "Software companies" refers to vendors offering human resource management systems (HRMS), examples being Management Science America (Atlanta, GA) and Information Science (Montvale, NJ).

B

Issues and Trends

Human resource managers are concerned with many issues including:

- A better understanding of the workplace and managing people, motivating and developing employees, and improving productivity.
- Providing timely, accurate information to top management and line managers to enable better decision making, and to integrate the human resource (HR) function with the business goals of the organization.
- Achieving the objectives of the human resource function in the most cost-efficient manner, and realizing cost savings in the area of employee benefits.
- The ability to respond to government issues and comply with government (federal, state, and local) laws and regulations.

Payroll services offered by major vendors include payroll processing, tax filing, and personnel reporting. The different payroll applications are shown in Exhibit I-1.

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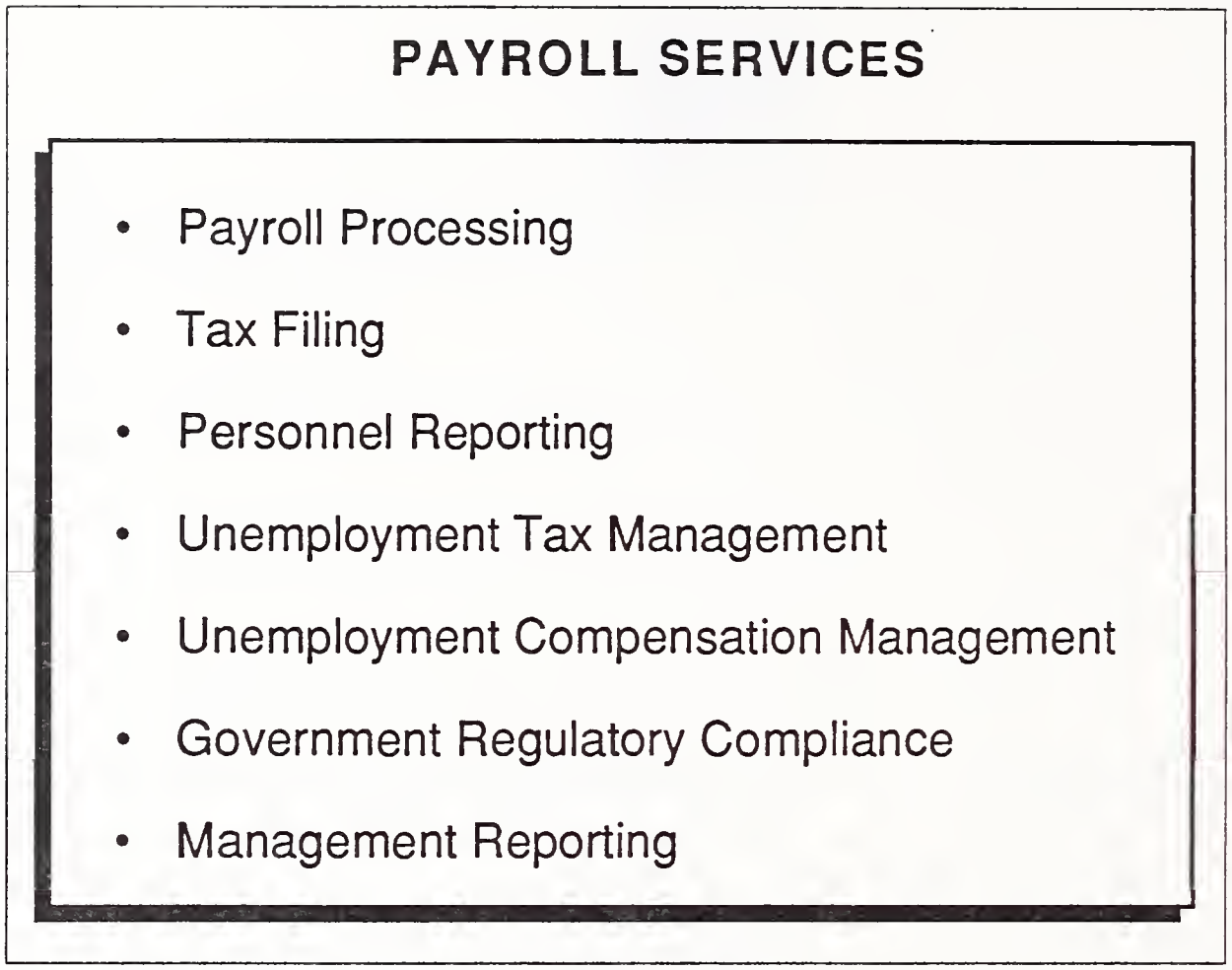
EXHIBIT I-1



HRMS usage has changed in many ways. Used originally as an administrative and record-keeping system, HRMS has evolved into a comprehensive integrated system used by HR managers and corporate management for business planning and other applications.

HRMS applications include payroll, personnel administration, benefits administration, and government compliance. Exhibits I-2A and I-2B list the various applications of human resource management systems.

The important criteria used by companies when evaluating HRMS are functionality or range of capabilities, vendor reputation, cost to install, cost to support and maintain, ease of use, ease and speed of implementation, and security features.

Microcomputer-based HRMS has improved significantly in recent years.

- Initially developed as a single-user stand-alone system, micro-HRMS can now be used by multiple users in a networked environment.

- The performance characteristics and functionality of micro-HRMS approach their mainframe counterparts. In addition, micro-HRMS are perceived to be easier to use.

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- Micro-HRMS are suited for companies with up to 5,000 employees. With continuing advances in microcomputer technology (memory, processing, networking), bigger organizations will be able to use microcomputer-based systems.

EXHIBIT I-2A

HRMS APPLICATIONS

- Payroll
- Benefits Administration
- Employee Relations
- Compensation Administration
- Government Compliance
- Applicant Tracking
- Manpower Planning
- Position Control

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EXHIBIT I-2B

HRMS APPLICATIONS

Payroll

- Payroll Administration
- Tax Reporting
- Flexible Earnings
- Payroll History

Benefits Administration

- Flexible Benefits
- 401(k)
- Profit Sharing Plans
- IRA
- Pension Plans

Employee Relations

- Time and Attendance
- Grievances
- Seniority
- Union/Labor Relations
- Employee Demographics, History

Compensation Administration

- Wage and Salary Structure
- Compensation Budgeting
- Salary Performance Review

Government Compliance

- EEOC
- AAP
- OSHA
- COBRA

Applicant Tracking

- Applicant Demographics
- Candidate Search
- Interview, Selection

Manpower Planning

- Career Planning
- Turnover Analysis
- Human Resource Forecasting

Position Control

- Inventory
- Budgeting
- Forecasting

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C

Events

Government legislation significantly influences the human resource function. Recent legislation and other laws pertaining to human resources are as follows:

- The Tax Reform Act of 1986 that overhauled the tax system entails changes in the tax structure for three years (1986 - 88).
- The Consolidated Omnibus Budget Reconciliation Act (COBRA) of 1986 mandates employers to extend health benefits to former employees.
- Occupational Safety and Health Administration (OSHA), Equal Employment Opportunity Commission (EEOC), and Affirmative Action Program (AAP) are other important regulatory issues.

In addition to federal laws, employers must also comply with legislation enacted by the different states and local governments. While some states may mimic federal changes, others may develop ways to make up for lost revenues due to tax reform.

D

Factors Spurring Growth

The key issues and trends stimulating the demand for human resource management systems are the following:

- There is greater corporate awareness on the role of the human resource function. HR has made great strides with respect to its status in the organization. Management has realized the value of employees toward the overall success of the organization and is willing to commit greater resources toward the personnel function. In many companies a senior executive heads the human resource function.
- The business environment is characterized by intense domestic and global competition as corporations strive to cut costs in order to remain competitive. Human resources is an area where cost savings can be realized.
- The economy is witnessing a greater number of mergers, acquisitions, and divestitures. This leads to the reorganization and dislocation of employees, emphasizing the importance of the human resource function.
- The growing shortage of qualified labor has led to greater corporate attention on reducing employee turnover by providing suitable growth opportunities and identifying attractive career paths.

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- Many companies offer flexible benefits programs. The number of companies offering these "cafeteria-style" benefits is expected to increase. Flexible benefits administration is facilitated by using HRMS.

- The administration and control of HRMS is moving from the hands of data processing to human resources as the human resource function seeks control over its own resources.

E

Factors Limiting Growth

Many companies continue to develop human resources systems in-house, often at great cost compared to commercially available products.

Any pending legislation that deals with human resources inhibits growth of HRMS as companies adopt a "wait-and-see" policy.

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II

Market Forecasts

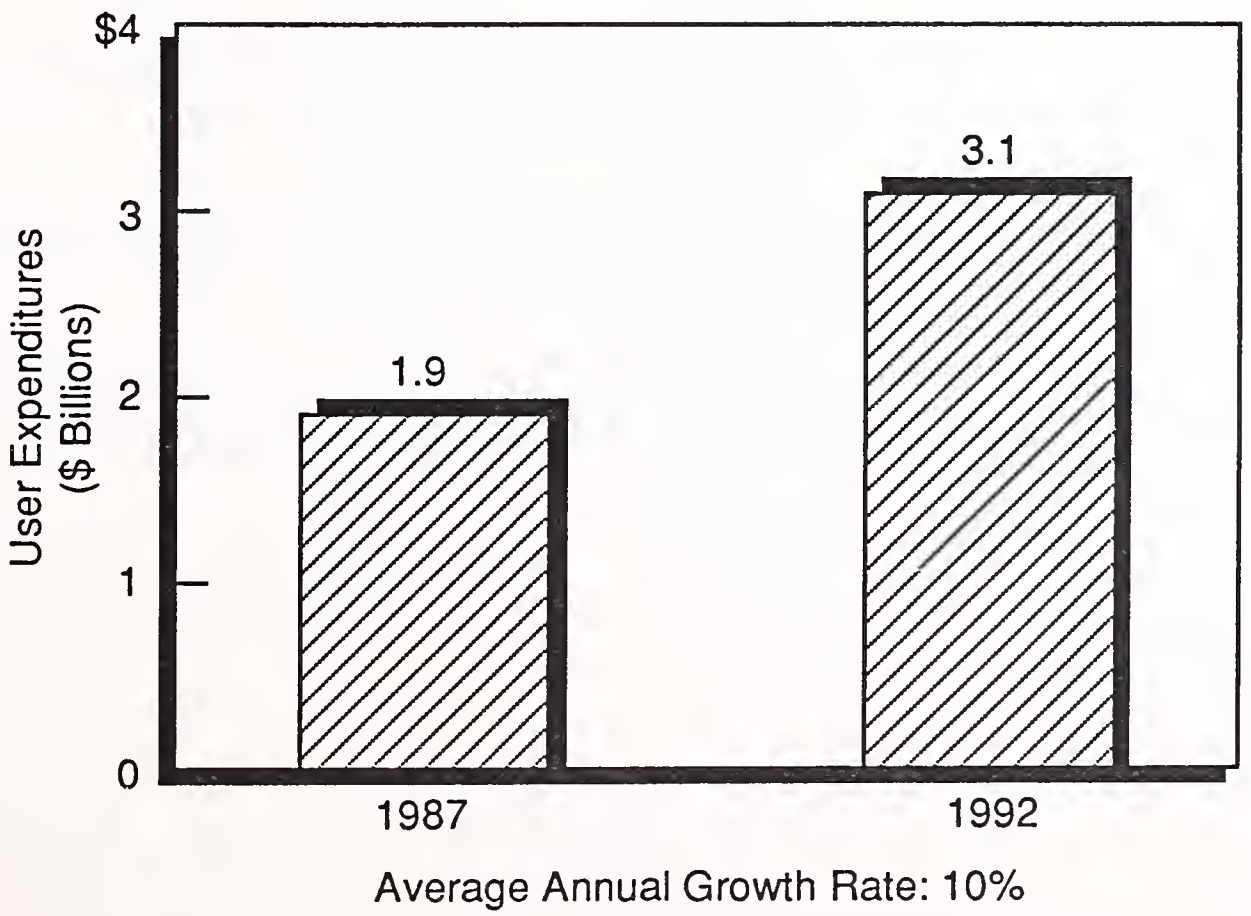
II

Market Forecasts

User expenditures for cross-industry human resources will grow 10% annually through 1992 increasing from $1.9 billion in 1987 to $3.1 billion in 1992, as shown in Exhibit II-1.

EXHIBIT II-1

HUMAN RESOURCES SECTOR INFORMATION SERVICES MARKETS, 1987-1992



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The positive factors influencing this market, discussed earlier, include the following:

- There is greater corporate awareness on the role of the human resource function.
- Human resources is an area where cost savings can be achieved and HRMS enables cost containment.
- Flexible benefits programs are easily administered using HRMS.

Forecasts for user expenditures by delivery mode are shown in Exhibit II-2. Among the different delivery modes, remote processing and batch processing will grow the most rapidly.

Appendix HR-A contains the forecast data base, by delivery mode, for each year from 1987 through 1992.

Processing services (remote computing and batch processing) that refers mainly to payroll and related services is expected to exhibit the strongest growth of 13%.

Application software, that is, mainly human resource management systems, is expected to grow 7% through 1992.

- The mainframe/minicomputer segment is expected to grow at a rate of 6% through 1992. Minicomputer software will exhibit a stronger growth compared to mainframe applications.
- Microcomputer software will exhibit the strongest growth of 20%. The proliferation of PCs and increasing computer literacy in businesses are contributing factors.

Turnkey systems will exhibit modest growth of 5% through 1992.

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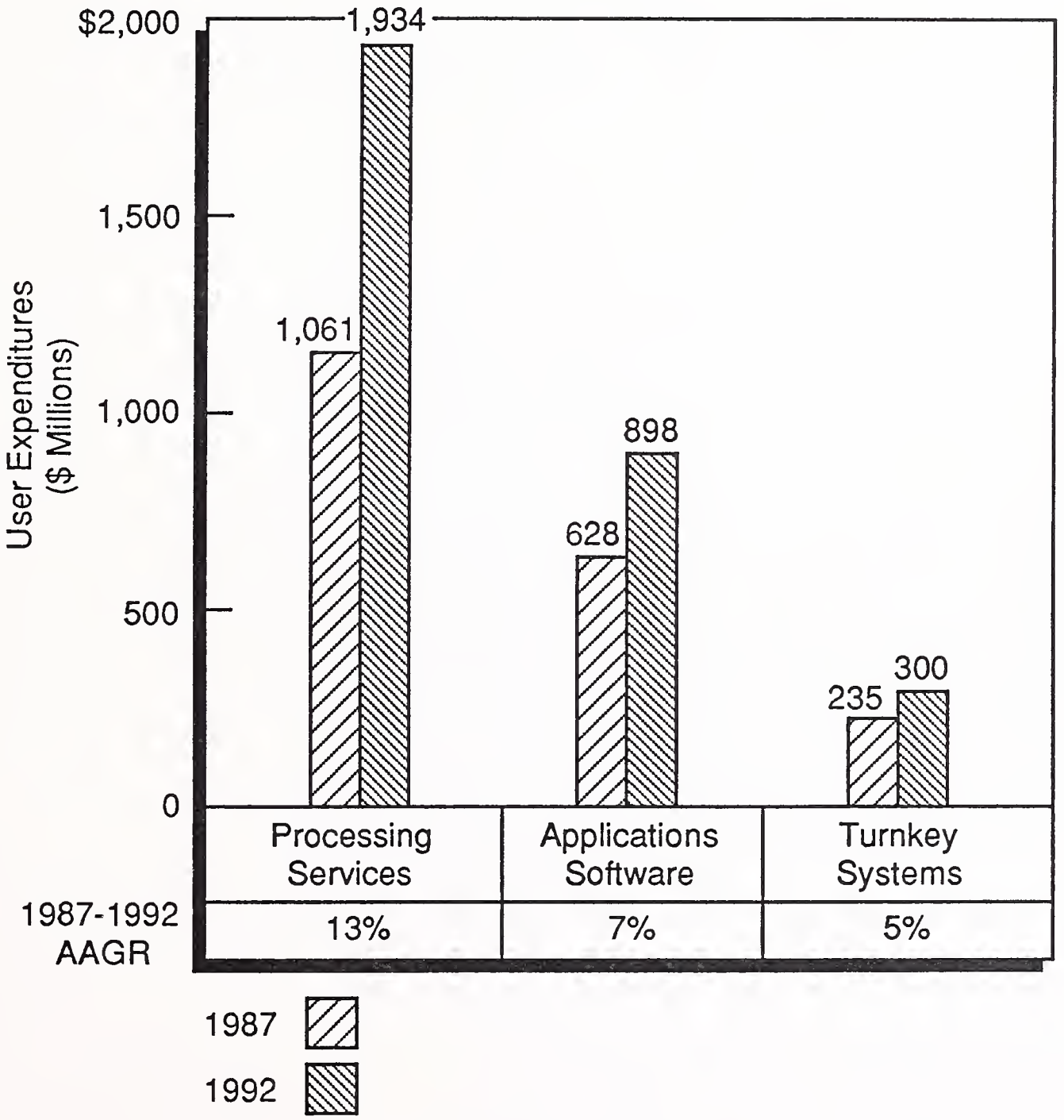
EXHIBIT II-2

HUMAN RESOURCES SECTOR INFORMATION SERVICES MARKETS BY DELIVERY MODE, 1987-1992



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Competitive Developments

Competitive Developments

A Introduction

The human resource marketplace is witnessing increasing competition. Each of the two groups, the service companies and the software companies, have broadened their product lines by providing services and products traditionally offered by the other group.

- Service companies like ADP and Paychex offer services such as compensation management and benefits administration that are related to the area of personnel administration.
- Two software companies (Information Science and Tesseract) have moved into the service arena by introducing payroll services on a time-sharing basis.

Competition is increasing in the payroll services arena. ADP is reaching out to small businesses and has built a separate sales force for accounts with fewer than 20 employees.

In the HRMS marketplace, Integral Systems is a fast-growing vendor. The company claims to be the "Number One" vendor, but this is disputed by Management Science America.

As the performance characteristics of microcomputers improve, more companies will consider a micro-based HRMS in preference to minicomputer or mainframe solutions.

Vendors offering microcomputer-based HRMS are growing in number, increasing the possibility of a shake-out in the marketplace. The companies likely to succeed are those that are adequately capitalized, have a strong marketing presence, and offer a full range of products and services backed by extensive service and support.

The leading vendors in human resources are shown in Exhibit III-1.

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EXHIBIT III-1

LEADING VENDORS IN HUMAN RESOURCES

Payroll Services

ADP

Paychex

Bank of America Business Services

Control Data Corporation Business Services

Mainframe/Minicomputer HRMS

MSA

Integral Systems

InSci (Information Science)

McCormack & Dodge

Microcomputer HRMS

Comshare

Mainframe Micros

Spectrum Human Resource

B

Mergers, Acquisitions, and Alliances

The insurance industry is active in the HR marketplace as these companies seek to provide more services to their customers. In August 1986, The Prudential Insurance Company of America acquired Tesseract Corporation. Tesseract markets mainframe-based human resource management systems.

ADP has developed joint payroll marketing relationships with over 800 commercial banks, many of which formerly did payroll processing for their customers.

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The human resource market witnessed the following mergers:

- Paychex acquired Payroll General in November 1986. Payroll General provides payroll services to small businesses.

- Integral Systems acquired Sysgen in August 1987. Sysgen develops human resource software for the IBM System/38 family.

C
Vendor Profiles

1. AUTOMATIC DATA PROCESSING, INC. (One ADP Boulevard, Roseland, New Jersey 07068)

a. Products/Services

Automatic Data Processing (ADP) is organized into six major groups. The "Employer Services" division provides payroll services and benefits administration services. Other services include workers compensation, unemployment compensation management, personnel reporting, tax services, and banking interfaces. Most of the Employer Services products are offered through the use of client-site microcomputers as well as by traditional courier delivery.

ADP offers three input modes: Work-sheet, Teledata, and PC Payroll. The Work-sheet method involves manually entering data on work-sheets that are picked up by ADP's courier service, while Teledata requires the client company to convey the payroll information over the telephone. PC Payroll allows a user, working with a PC and modem, to directly input payroll data into ADP's mainframe.

Autopay I payroll service is aimed toward small clients with 8 to 24 employees. Autopay II payroll service focuses on companies with 25 to 500 employees. The Interactive Payroll and Personnel (IPP) service is an on-line processing service offered to companies with more than 500 employees and multiple locations.

b. Company Directions

Since the early 1960s ADP has implemented an active acquisition program to diversify from its primary business of providing payroll services. In 1986 Employer Services accounted for 45% of revenues.

ADP has developed joint payroll marketing relationships with banks. In certain cases ADP acquires the payroll services of the commercial banks.

New products introduced by ADP are PC Personnel and Report Writer.

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2. PAYCHEX, INC. (911 Panorama Trail South, Rochester, New York 14625)

a. Products/Services

Paychex provides batch processing services to small and medium-sized businesses nationwide. Paychex markets its services principally to companies employing fewer than 100 people.

In addition to payroll services, Paychex handles related wage returns and tax deposits such as unemployment insurance, earnings history, and reconciliation of tax withheld.

Paychex also provides its customers with a series of specialized publications relating to payroll and tax information. These publications are provided free of charge.

b. Company Directions

Paychex continues to expand and plans to open additional branch operating centers.

In 1986 Paychex began test marketing "fringe benefit" products including life, health, disability, and worker's compensation insurance, and individual retirement accounts. The products are issued by insurance companies with Paychex acting as agent or broker. Paychex (in November 1987) is still evaluating this new venture.

In November 1986, Paychex acquired Payroll General Corporation (Minneapolis, MN), a firm providing payroll services to small businesses in the Minneapolis-St. Paul area.

3. MANAGEMENT SCIENCE AMERICA, INC. (3445 Peachtree Road, North East, Atlanta, Georgia 30326)

a. Products/Services

Management Science America (MSA) develops and markets application software for a variety of cross-industry and vertical markets. Cross-industry market segments include human resources and financial applications. In addition, MSA offers software products for the following vertical markets: manufacturing, health care, higher education, financial institutions, and government.

In the area of human resources MSA's flagship product is its Payroll/Personnel System. In June, this software product won the "Over $250

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million status" award given by ICP Software Directory for having achieved $250 million in total sales since product introduction.

The Payroll/Personnel System includes a wide range of applications including payroll, personnel, benefits, and employee relations.

- In addition to standard payroll functions, MSA's software provides for flexible earnings, special hours, employee taxes, and regulatory reporting.

- The Benefits Administration module helps administer 401(k), IRA, Employee Retirement Income Security Act (ERISA), flexible benefits, and deferred compensation plans such as profit sharing plans and thrift/savings plans.

- Government compliance - Payroll/Personnel enables regulatory compliance with EEOC, AAP, and OSHA.

- The Compensation Administration module provides for job evaluation, wage and salary structure, budgeting, employee evaluation, and salary and performance review.

- Manpower Planning involves human resource forecasting, turnover analysis, career planning, and skills inventory.

- The Employee Relations module provides for time and attendance, disciplinary actions, grievances, seniority, and labor relations.

Payroll/Personnel System incorporates "expert system" components such as Expert Reporting. The software is functionally integrated with other MSA products including General Ledger, Forecasting and Modeling, and Manufacturing Systems.

ALLTAX provides tax coverage by calculating payroll and withholding taxes for businesses.

b. Company Directions

MSA markets its human resources software products across all industries.

MSA is examining developing HR applications for the minicomputer market segment, particularly the DEC VAX minicomputer.

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4. INTEGRAL SYSTEMS (2185 North Carolina Boulevard, Walnut Creek, California 94596)

a. Products/Services

Integral Systems' product offering includes a family of modular, integrated human resource management systems. The products operate on IBM mainframes and also on IBM S/38.

Integral Systems' HRMS provides for Payroll Processing, Benefits Administration, Personnel Management, Applicant Tracking, Position Control, and Report Writers/Query Facilities.

In 1986 Integral Systems introduced the HR-Spectrum series that enables a user to download data from a host computer to a PC, for planning and analysis. HR-Spectrum consists of the following modules: OrgChart, CAAPS (Comprehensive Affirmative Action Planning System), Succession Planner, HR-1, and Compensation Workbench.

b. Company Directions

In April-May 1987, as part of its marketing efforts, Integral Systems organized a series of sales-promotion seminars in 25 major cities in the U.S. and Canada.

In May 1987 the company issued a preliminary prospectus in anticipation of an initial public offering. However, as of November 1987 the sale of shares has been put on hold pending favorable market conditions.

Integral Systems acquired Sysgen in August 1987. Sysgen (Durham, NC) develops software for the IBM System/38. Sysgen is responsible for System/38 software allowing Integral Systems to concentrate on the mainframe market.

New products to be introduced are Flexible Benefits and Pension.

5. INFORMATION SCIENCE INCORPORATED (95 Chestnut Ridge Road, Montvale, New Jersey 07645)

a. Products/Services

Information Science (InSci) markets a series of HRMS software products for mainframes, minicomputers, and microcomputers.

InSciPayroll and InSciPersonnel applications provide for the basic HR functions. An integrated Personnel/Payroll system is also available.

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InSci's other products include InSciPension Administration System, InSci FlexComp (Flexible Benefits System), and EEOC/Affirmative Action Planner.
As a result of InSci's acquisition of Wang's HRMS division, the company offers software products for Wang VS minicomputers. The products include InSci/VS Payroll/Personnel and InSci/VS FlexComp.

In March 1986, InSci introduced InSciPersonality, a comprehensive HRMS for the IBM PC. InSciPersonality addresses Compensation, Benefits Administration, EEO/AA, COBRA, Applicant Tracking, Career Development, Skills Inventory, Manpower Planning, Training, and Labor Relations.

In addition to software products, InSci offers payroll processing services. This service is offered in the New York metropolitan area.

b. Company Directions

InSci introduced a number of new products in 1987.

- MicroGRS provides the ability to download information from an InSci mainframe system to an IBM PC. MicroGRS integrates with other PC productivity software.

- InSciMicroDuet is a microcomputer software package that enables remote data entry on a PC to update the mainframe system.

- Infobot (Information robotics) enables employees to have direct access to their data on the InSci system from any touch-tone phone.

InSci plans to introduce InSci/VS COBRA, software that provides for COBRA administration and compliance.

InSci is developing DB2, 9370, and PS/2 versions of its human resource software products.

InSci's goal for 1988 is to become the only HRMS vendor to fully implement IBM's SAA (Systems Application Architecture) within its product line.

6. McCORMACK & DODGE CORP. (1225 Worcester Road, Natick, Massachusetts 01760)

a. Products/Services

McCormack & Dodge is a supplier of financial, human resource, and manufacturing applications software.

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McCormack & Dodge specializes in human resource management systems for the IBM mainframe environment. The HRMS product line consists of several modules including Payroll, Benefits Administration, Personnel, Safety and Health, Position Control, and Applicant Flow.

b. Company Directions

The company intends to focus on a few vertical markets such as healthcare, banking, and insurance.

A new product under consideration by McCormack & Dodge is a PC version of its HRMS.

7. COMSHARE, INC. (3001 South State Street, Ann Arbor, Michigan 48104)

a. Products/Services

Comshare offers software products in three areas: human resources management (Profiles), decision support (System W DSS), and executive information systems (Commander EIS).

Comshare develops and markets Profiles/3000 for the HP 3000 minicomputer and Profiles/PC for the IBM PC. Comshare is the leading vendor in the microcomputer market segment.

Profiles/3000 handles general administration, employee benefits, attendance, EEO/OSHA, and applicant tracking.

Profiles/PC Employee Record-keeping covers employee information (current and historical), salary, employee demographics, absenteeism, and COBRA compliance.

Profiles/PC Applicant Tracking system handles applicant demographics, candidate search, EEO compliance, and management reporting.

Profiles/PC Job Evaluation provides for job title, job group, union status, and EEO category.

b. Company Directions

In November 1987 Comshare introduced a new product, Profiles/PC Plus, software that transforms an employee record-keeping system into a management reporting system. Profiles/PC Plus also enables the easy creation of standard and custom reports for use by management.

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A new product that Comshare plans to introduce in the second quarter of 1988 is a payroll interface software product. This product will enable Profiles users to interface with payroll applications provided by vendors such as ADP, Paychex, Bank of America, and Control Data.

8. MAINFRAME MICROS, INC. (1180 Avenue of the Americas, New York, New York 10036)

a. Products/Services

Mainframe Micros develops HRMS for the IBM PC. The company's flagship product is HR-1 Human Resource Information System.

The products offered under the HR Professional Series include HR-1, HR-Applicant Tracking, HR-Information Link, and HR-Networker.

b. Company Directions

Mainframe Micros acquired Cosmos (Bellevue, WA), developer of Revelation data base. The two companies are now organized under a holding company called Revelation Technologies (New York, NY).

New products under development are HR-Position Control and HR-Flexible Benefits. The company also plans to upgrade HR-1.

Mainframe Micros plans to continue to focus on the microcomputer segment.

9. Other

Tesseract Corp. (San Francisco, CA), a subsidiary of The Prudential Insurance Corp. of America markets human resource management systems for IBM mainframes.

- Tesseract's products include Payroll System, Personnel Management System, Benefit Plan Administration System, and Cafeteria Benefit Administration.
- The company focuses on large corporations (Fortune 100).
- In the payroll services area, several new products are under development that Tesseract hopes to introduce in 1988.
- The company is examining developing a microcomputer-based HRMS.

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Genesys Software Systems, Inc. (Lawrence, MA) specializes in human resource management systems for the IBM mainframe environment.

- Genesys' products include Payroll Accounting, Personnel Administration, Defined Benefits Management, Defined Contribution System, and Human Resource Planning.

- The company has a large presence in banks and insurance industries. Another vertical market Genesys is focusing on is hospitals and healthcare.

Cyborg Systems, Inc. (Chicago, IL) develops HRMS for companies with more than 400 employees.

- Cyborg has developed applications to run on a variety of hardware systems including IBM mainframe, DEC VAX, Unisys, HP 3000, NCR, Data General, and Control Data.

- The software functions are human resource record-keeping, benefits administration, EEO/AA/OSHA, salary administration, time and attendance, applicant tracking, manpower planning, and position control.

Personnel Data Systems, Inc. (Plymouth Meeting, PA) offers mainframe- and minicomputer-based software. The company has developed HR applications for IBM mainframe and S/38, DEC VAX, Unisys, HP 3000, Honeywell and Prime. Personnel Data Systems concentrates primarily on minicomputer applications.

Cullinet Software, Inc. (Westwood, MA) markets Human Resource System - Personnel for IBM mainframes. The software provides for job, location, service, performance, and salary history on all employees. The product integrates with Cullinet's Human Resource System - Payroll and IDMS/R.

Spectrum Human Resource System Corp. (Denver, CO) specializes in the microcomputer market. The company's products include HR/2000 and Applicant Management System. The Continued Health Benefits Module integrates with HR/2000 and enables COBRA compliance.

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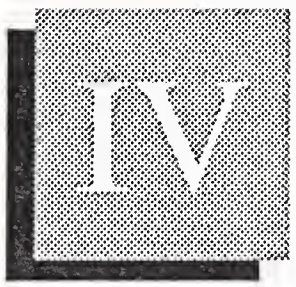

New Opportunities

New Opportunities

The human resource market is a growing market and opportunities are aplenty for HR software vendors. Companies outgrow their in-house HR systems as their data processing departments are faced with increasing backlogs of software development.

INPUT estimates that only 30 percent of medium-sized and large organizations have HRMS installed, suggesting a vast potential market.

The opportunities in the mainframe, minicomputer, and microcomputer market segments roughly parallel the growth of these computer hardware systems.

- The strong growth of microcomputers viewed along with the enhanced role of the PC in corporate computing makes this the most promising segment. The microcomputer industry has witnessed a number of significant developments. These include Intel's 80386 microprocessor, IBM's Personal System/2 series of computers, and Microsoft's OS/2 operating system. The much greater performance characteristics of microcomputers made possible by these advances offer new opportunities for vendors developing applications for this market segment.

- Unlike the mainframe market (where IBM is the predominant vendor) the minicomputer marketplace is characterized by many manufacturers with no one company dominating the market. This has inhibited to a certain extent HR vendors from developing applications as it would entail developing and porting software for different systems. However, the high growth of minicomputers and departmental systems in recent years will propel HR vendors to take a closer look at this market segment.

A new opportunity for HRMS vendors lies in turnkey systems using workstations. An example (in another area) is Sun Microsystems (Mountain View, CA). Sun, manufacturer of engineering workstations, has developed a financial system for investment banking firms.

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Since the human resources sector consists of two segments, service companies and software companies, new opportunities for each segment are products and services traditionally offered by the other group.

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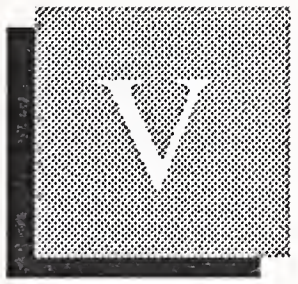

Conclusions and Recommendations

Conclusions and Recommendations

Many companies continue to develop human resource applications in-house, often at great cost. Hence educating and convincing the user on the benefits of using a commercial product is of importance to HRMS vendors.

As the control and administration of human resource management systems moves from the hands of data processing to the human resources department, it becomes imperative for HR software vendors to design human resource systems from a HR rather than a DP perspective.

The most promising products and services will be those that fully exploit technology advances in the areas of relational data base technology, distributed data processing, networking, and expert systems.

Human resource management systems of the future will reflect developments in artificial intelligence (AI) and fourth generation languages (4GL). HRMS will be easy to learn and easy to use, will have English language front-ends, and will allow users to define and build their own systems including menus, inquiry screens, and custom reports.

Many companies use HR products from more than one vendor suggesting that they are not able to meet all their requirements from one company. Looking into the future (Exhibit V-1), INPUT foresees the eventual integration of the payroll and personnel/human resource functions. Both the service companies and the software companies will offer a complete range of products and services by moving into the other's territory. To achieve this, strategies vendors can use include new product development, strategic alliances and joint ventures, and mergers and acquisitions.

Adequate capitalization and a strong marketing presence are crucial to the success of companies offering microcomputer-based HRMS. Also, vendors should offer bundled services similar to those offered by mainframe vendors. This includes software upgrades, training, service and

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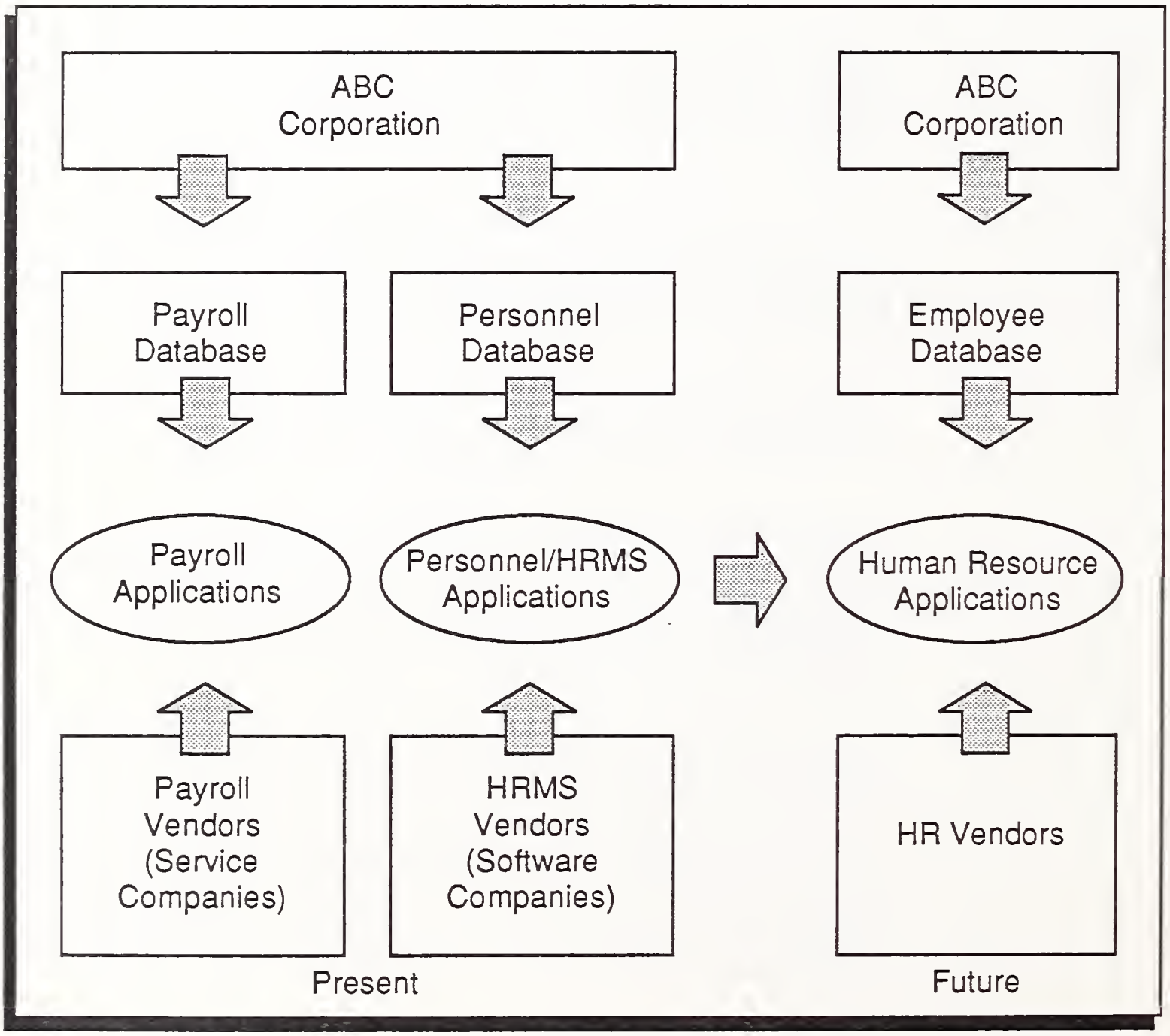
maintenance, and hot-line telephone support. However this is easier said than done since the low price of microcomputer software makes this difficult to achieve.

Although human resources is a cross-industry application, vendors may consider focusing on vertical markets like healthcare and banking as some of them have already done.

EXHIBIT V-1

HUMAN RESOURCES - PRESENT VERSUS FUTURE



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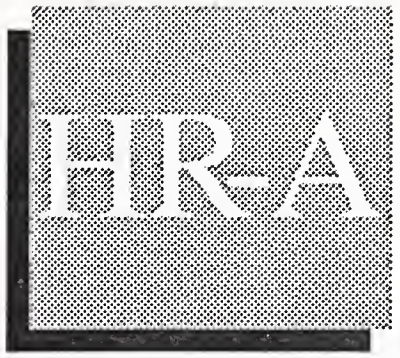

Appendix: Forecast Data Base: Human Resources Sector

HR-A

Appendix: Forecast Data Base: Human Resources Sector

- This appendix contains the following forecast information, as shown in Exhibit HR-A.
- Market size by delivery mode for each year, 1986-92
- Market growth rates for 1986-87
  - Average annual growth rate (AAGR) for each delivery mode for the five-year period 1987-92.

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EXHIBIT HR-A-1

HUMAN RESOURCES SECTOR
CROSS-INDUSTRY
USER EXPENDITURES FORECASTS, 1987-1992

SEGMENTATION BY DELIVERY MODE	1986 ($M)	1986-1987 Growth	1987 ($M)	1988 ($M)	1989 ($M)	1990 ($M)	1991 ($M)	1992 ($M)	AAGR 1987-1992 (Percent)
Remote Computing/ Batch	932	14	1,061	1,221	1,386	1,552	1,746	1,934	13
Application Software									
Mainframe/Mini	485	20	582	673	732	764	778	783	6
Micro	37	24	46	57	67	84	100	115	20
Total Application Software	522	20	628	730	799	848	878	898	7
Turnkey Systems	217	8	235	251	267	280	291	300	5
Cross-Industry Total	1,671	15	1,924	2,202	2,452	2,680	2,915	3,132	10

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About INPUT

INPUT provides planning information, analysis, and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, and communications and office products and services.

The company carries out continuous and in-depth research. Working closely with clients on important issues, INPUT's staff members analyze and interpret the research data, then develop recommendations and innovative ideas to meet clients' needs. Clients receive reports, presentations, access to data on which analyses are based, and continuous consulting.

Many of INPUT's professional staff members have nearly 20 years of experience in their areas of specialization. Most have held senior management positions in operations, marketing, or planning. This expertise enables INPUT to supply practical solutions to complex business problems.

Formed in 1974, INPUT has become a leading international planning services firm. Clients include over 100 of the world's largest and most technially advanced companies.

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U.S. INFORMATION SERVICES
CROSS-INDUSTRY MARKETS, 1986-1991
OTHER CROSS-INDUSTRY SECTOR

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U.S. INFORMATION SERVICES
CROSS-INDUSTRY MARKETS, 1986-1991
OTHER CROSS-INDUSTRY SECTOR

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I ISSUES, TRENDS, AND EVENTS

A. INTRODUCTION

- The applications included in the other cross-industry sector forecast are:
  - Electronic publishing.
  - Graphics.
  - Sales, marketing, and distribution.
  - Word processing.
  - Miscellaneous.
- Electronic publishing uses computer systems and peripherals to produce high-quality printed materials that can combine text and graphics. Electronic publishing on mainframe and minicomputers is called corporate electronic publishing and on microcomputers is called desktop publishing.
- The graphics segment includes business graphics and presentation graphics as well as mapping.

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- Some of the application areas included in the sales, marketing, and distribution segment are sales and marketing management, sales and marketing productivity, sales forecasting and analysis, direct marketing/response, telemarketing, market research, and distributuion management, accounting, and analysis.

- The miscellaneous segment includes applications such as voice mail, electronic mail, and integrated office systems (e.g., DEC's All-in-One and IBM's PROFS).

B. ELECTRONIC PUBLISHING

- Corporate electronic publishing on mainframes and minicomputers is used primarily by companies that need to generate large volumes of long or complex reports, proposals, technical documents, product documentation, directories, or catalogs. Previously, these companies contracted with commercial typesetters and off-premises printer organizations.

- The desktop publishing market began in early 1985 when Apple Computer, Inc. introduced the LaserWriter, combined it with the Macintosh and special software, and promoted the package as a low-cost way to produce high-quality memos, newsletters, price sheets, labels, and overhead foils. This is also when Aldus Corporation introduced its PageMaker page layout software product.

- There are many benefits derived from electronic publishing, including the following:

  - Improved control over turnaround time. Since projects are done in-house, competition for resources and priority are within the company instead of against a commercial graphics vendor's other customers.

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- Time and cost savings in correcting errors. Errors can be caught and corrected on the screen or from the output.

- A relatively short payback period. Commercial typesetting and graphic design is expensive. Through electronic publishing users can achieve high-quality composition and drafting at a fraction of the cost.

- However, some potential users are hesitant to purchase electronic/desktop publishing systems for the following reasons:

  - Evolving hardware technology. The quality, speed, and resolution of laser printers is constantly improving. Companies in certain industries are waiting for the market to develop before purchasing.

  - Unstable pricing. Due to advancing technology, prices have dropped. Increased competition in hardware, including that from foreign vendors, is heating up. Competition between vendors to increase market share has also contributed to lower prices.

  - Confusion. A large amount of attention has been given to desktop publishing since 1985. The number of vendors offering desktop publishing systems and software has mushroomed in the same period. Potential users need to be educated and assisted in choosing and purchasing the components of a system that will fit their needs.

  - Lack of a PC-compatible solution. Many users are committed to an IBM PC-compatible hardware strategy. It is only very recently that software has been made available in the PC environment.

  - Lack of an IBM directional statement. It was not until March 1987 that IBM expressed its initial plans to incorporate PostScript, thereby showing some direction for its customers.

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- As technology continues to develop, lower investment costs for desktop publishing will result. In May 1987 Ashton-Tate introduced a desktop publishing package that runs on the current installed base of personal computers without requiring additional purchases of mouses, high-resolution monitors, accelerator cards, or graphics cards.

- Another trend is increased use of alternative input devices such as image scanners and optical character recognition (OCR) devices. Several vendors have introduced products to support these input devices, and many other vendors have products in development.

  - Adobe Systems' new product, Illustrator, allows users to work with scanned images to embellish and fill out these images to create complex art.

- With IBM's March 1987 agreement to license Adobe Systems' PostScript page description language, PostScript has become the de facto industry standard.

  - More than 15 vendors in addition to Apple currently ship products using PostScript, and many software vendors have or are developing applications that support PostScript.

  - PostScript's competition includes Imagen's DDL-document description language and Xerox's Interpress.

    . Imagen and Hewlett-Packard, Imagen's customer, were expected to deliver product with DDL in mid-1987. However, H-P decided to use PostScript or a PostScript compatible.

    . Xerox has already shipped product with a reduced functionality (non-editable) version of Interpress, but only for its very high-end laser printer--the Xerox 9700.

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- The basic components of an electronic publishing system are hardware; a CPU or 32-bit workstation; a page description language to bridge the CPU and laser printer; applications software; and input and output devices such as image scanners, optical character recognition (OCR) devices, laser printers, typesetters, and slidemakers.

  - An example of a corporate electronic publishing system is Interleaf's Technical Publishing Software turnkey system which includes a 32-bit workstation, a bit-mapped screen, Technical Publishing Software, a Structured Document Editor, a laser printer, and other peripheral devices.

  - An example of a desktop publishing system includes a Macintosh, MacDraw, MacPaint, MacWrite, Aldus' PageMaker, and a LaserWriter using PostScript.

C. GRAPHICS

- Since the early 1980s there has been a heavy emphasis on graphics. Many current graphics users acquainted themselves with graphics through such integrated packages as Lotus 1-2-3, SuperCalc, or Framework.

  - With the increased awareness of graphics, the proliferation of graphics software products, the improved ease in the use of software, and growing computer literacy, many businesses have increased their use of graphics and brought graphics functions in-house.

  - Although the majority of graphics are used in reports, the use of computer-integrated graphics in presentations is growing rapidly. There is also a migration from monochrome to color graphics and to alternative output mediums including color slides.

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- Some of the leading vendors of microcomputer software have acknowledged the need for improved graphics capabilities by acquiring the rights to graphics software packages or acquiring graphic software companies. Major acquisitions include Decision Resources by Ashton-Tate, Graphic Communications by Lotus Development, and various graphics and graphics-related products by Software Publishing.

- Since personal computers (PCs) were introduced, users have used mainframe applications from their PCs. However, with the introduction of the IBM PC-AT, the migration of mainframe applications to the PC level has increased.

- Some of the major concerns of the use of PC graphic applications include the speed of processing, the quality of output, the difference between the screen image and the final output, and the cost between alternatives.

  - Improved/faster microprocessors including the Intel 80286 (PC-AT) and 80386 (introduced in late 1986) and the Motorola 68000 combined with improved operating speeds of these chips allows for faster graphics processing.

  - Another trend is for graphics processing to be included on the motherboard or graphics card which allows for faster processing.

  - Introduction of high resolution laser printers and graphics plotters allow for high-quality output. As technology advances, high-quality alternate output devices such as slidemakers will become more affordable.

  - Improved graphics cards and color monitors are allowing more colors and higher resolution so that users have a more accurate idea on screen of what output will look like.

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  - IBM has introduced Video Graphics Array (VGA) for improved graphics capability. There are concerns that the new standards are not fully compatible with the CGA and EGA standards now in use.

  - Many software vendors and users have supported EGA, which has the most momentum behind it to be the de facto industry standard for graphics on PCs.

  - Some board and monitor manufacturers are making products that adapt to the user's graphic standard.

- Improved and advancing technology and increased competition as well as high volumes are lowering graphics software prices.

- The mainframe and minicomputer graphics market is affected by some of the same issues and trends as in the microcomputer market.

- The increasing sophistication of output devices, e.g., laser printers, and the lower prices due to economies of scale and improved cost-effective technology will help persuade more companies to produce graphics internally.

- Advancing computer technology on mainframe and minicomputers is improving processing speeds and memory capacities while costs are lowering. This makes purchase of these systems more cost-effective than before.

- Graphics vendors are addressing mainframe and workstation combinations that would allow programs to be run locally on workstations and then outputted from any of the graphics output devices that are hooked up to the mainframe.

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- Because of the emphasis on personal computers, some graphics vendors are introducing products that will allow downloading of graphics functions onto PCs.

- With the spreading use of graphics in the corporate environment, vendors are trying to make their systems more user friendly so that business executives can execute their own charts and exhibits with very little training. Some vendors are accomplishing this task by offering menu commands or natural language commands.

- Despite the acquisition of ISSCO by Computer Associates in December 1986 and the discontinued acquisition negotiations between Pansophic and SPSS, the trend toward acquisition of graphics software companies is not seen in the minicomputer and mainframe market.

D. SALES, MARKETING, AND DISTRIBUTION

- Until the late 1970s very few systems were developed specifically for sales and marketing functions. Even now, in those companies whose sales and marketing departments are automated, the majority of sales and marketing managers still use integrated software packages, spreadsheets, data base management systems, and other general decision support systems.

- However, there is a trend toward developing specialized applications software that takes into account the specific needs of the sales and marketing departments.

- The specialized applications of most interest include the following:

  - Marketing data base systems which contain customer and prospect account information and histories. Some of the systems available now

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allow users to show customer ordering patterns, track prospects, integrate purchased or rented mail lists, or accomplish market segmentation using demographics. Some vendors include Adelie, Marketing Information Systems, and Armor Systems.

- Sales analysis and forecasting systems that provide analysis on products by units or dollar volume or on sales by territory, store, or vendor and also take into account seasonality or other cyclical trends. MDS Associates and MCBA, among many other vendors, offer such systems.

- Telemarketing systems which may include script/data prompting, telephone call scheduling, automated dialing for outbound calls and lead source tracking, order entry, and tickler files for follow-up activities. These systems are often connected to a marketing data base system. Some vendors are Arlington Software and Systems, Multi Systems, and International Computerized Telemarketing, Inc.

- Prospect tracking systems that provide basic client information, contact names, latest and planned contact dates, quota and commission rates, call reports, and call analysis. Some vendors are CTek Software, Key Systems, Executive Data Systems, and Excalibur Systems, Inc.

- Management systems that assist sales and marketing managers in the evaluation and planning of marketing programs, sales performance, and product acceptance and in identifying trends and patterns. Two vendors are JEB Systems and GMD Systems International.

- Direct mail systems that process data base information on demographics and sales histories for targeted mailings, merge external lists, purge duplicate listings, and provide on-line updating capabilities. Processing vendors include Metromail, CCX Network, and MAGI, among others. Software vendors offering products include Persoft and Computron Technologies Corporation.

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- In recent years there has been an increase in direct mail marketing. Shopping by mail is becoming more popular as people find less time to shop because of a career, family, or a busy social calendar. In addition to mail order catalogs, many vendors use direct mail as a relatively low-cost medium to direct promotional advertisements to customers in their geographic market area.

- Due to higher postal costs and expensive printing and publishing costs, users of direct mail processing services are demanding list segmentation to more narrowly define their audiences.

  - In addition to list segmentation based on demographics such as age, gender, zip code, etc., there is demand for integration of customer data bases that contain sales histories with the mailing list systems to produce very targeted mailings.

- Another area of interest is in portable personal computers or terminals to increase productivity of field sales and marketing representatives. These systems allow field representatives access to customer sales histories and to enter orders remotely.

  - Although there are products currently available, the market for remote communications cannot reach its potential until hardware technology advances to make portable PCs of lighter weight and less expensive. These units must also be fully functional with sufficient memory and a good screen.

- This segment includes only information services for distribution functions that are not for a specific industry. Distribution applications can also be found in the retail distribution sector, the wholesale distribution sector, and the transportation sector.

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- In many industries, but especially in those where products are fairly homogeneous, vendors compete on service. These services may include expedited delivery on orders, guaranteed in-stock inventory, guaranteed delivery dates, quantity price breaks, or special billing/invoicing terms.

  - Distribution application systems such as distribution center and warehouse management systems, inventory information systems, order entry and processing systems, and billing/invoicing systems allow vendors to deliver on such extra services.

  - Distribution systems provide vendors with information on the best way to get the needed products to the proper place at the right time.

E. WORD PROCESSING

- The word processing market has matured and is approaching saturation. The growth rate of personal computer shipments has slowed, and because microcomputer word processing software shipments are linked to PC shipments, the microcomputer word processing market will also grow at a slower rate.

- The market for word processing will be negatively impacted by the electronic publishing market.

  - Desktop publishing will have a greater impact on word processing than corporate electronic publishing on mainframes or minicomputers.

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F. MISCELLANEOUS

- In the late 1970s and early 1980s the concept of integrated office systems began growing. These systems provide for the integration of such functions as word processing, graphics, spreadsheets, data base management, electronic mail, and other office applications.

- Some of the problems integrated office systems (IOS) vendors are facing include the following:

  - Connectivity between systems to allow file transfer and conversion between hosts, workstations, and applications from one or more vendors. This includes:

    . Technical connectivity that enables one operating system to communicate with another.

    . Application connectivity that will ensure that boldface in a word processing document will still be boldface after the transfer or that data from a spreadsheet will be in the same corresponding cell after the transfer.

  - Integration of office automation applications while providing common user interfaces for easy access to well-developed functions.

  - Support of personal computers including PC versions of vendors' office automation operating systems to distribute office functions onto PCs. Most currently available micro-to-mainframe links do not address office automation integration needs adequately.

  - Connectivity of integrated office automation functions in a multi-vendor environment.

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- Electronic mail capability beyond internal corporate users.

- Some of the more prominent IOS vendors have introduced products that begin to address the above problems.

  - IBM and minicomputer vendors introduced versions of Distributed Office Support Systems (DISOSS) in order to connect DEC, Data General, Wang, and IBM systems. They have announced support for the new peer-to-peer communications link known as LU6.2 or APPC.

    . However, DISOSS still does not provide all the connections needed or desired. In addition, DISOSS and its counterparts from minicomputer vendors are expensive and difficult to install and use.

    . Companies such as Communication Solutions and System Strategies are developing communications software to help the minicomputer vendors.

  - DEC's All-in-One electronic mail system can be linked to IBM's Professional Office System Support (PROFS) electronic mail system using Soft-Switch, Inc.'s products.

- Additional technologies to be incorporated into IOS will include:

  - Voice integration. DEC offers DECTalk which translates E-mail text into voice.

  - Image processing, i.e., scanning input devices.

  - Artificial intelligence.

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- The voice mail market will be heavily impacted by the entrance of the Regional Bell Operating Companies (RBOCs) into the market.

  - RBOCs are still restricted in some of their enhanced service offerings and must wait for the resolution of the Computer Inquiry III that may affect how they will offer voice messaging and storage services.

  - Some local telephone companies, while still regulated by their state public utility commissions, are already entering the market. Their entrance has not had as dramatic an impact on current vendors as the RBOCs' entrance will have.

- As technology advances, voice mail hardware component costs are dropping. Disk storage prices are declining and compression algorithms are improving, allowing for more voice storage per megabyte per dollar.

- New applications that will need to be addressed within the next two years include:

  - Integrated voice and text services.

  - Voice recognition that eliminates manual entry of commands. This is especially useful for applications where both hands are needed for other purposes or for telephone voice inputting of data.

  - Integration of previously disparate office automation applications.

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II MARKET FORECASTS

A. INTRODUCTION

- User expenditures for other cross-industry applications will grow 14% annually through 1991, increasing from $2.8 billion to $5.4 billion in 1991. For details, see Exhibits II-1, II-2, and OC-A-1.

- The mainframe/mini software market will enjoy a rapid growth rate at 25% annually from $385 million in 1986 to $1.2 billion in 1991.

- Microcomputer applications software expenditures will grow at 20%, from $570 million in 1986 to $1.4 billion in 1991.

- Turnkey systems will grow 10% annually, from $1.1 billion in 1986 to $1.8 billion in 1991.

- User expenditures for processing services will grow at a low rate of 8% annually from $683 million in 1986 to $982 million in 1991.

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OTHER SECTOR FORECAST
CROSS-INDUSTRY INFORMATION SERVICES
1986-1991

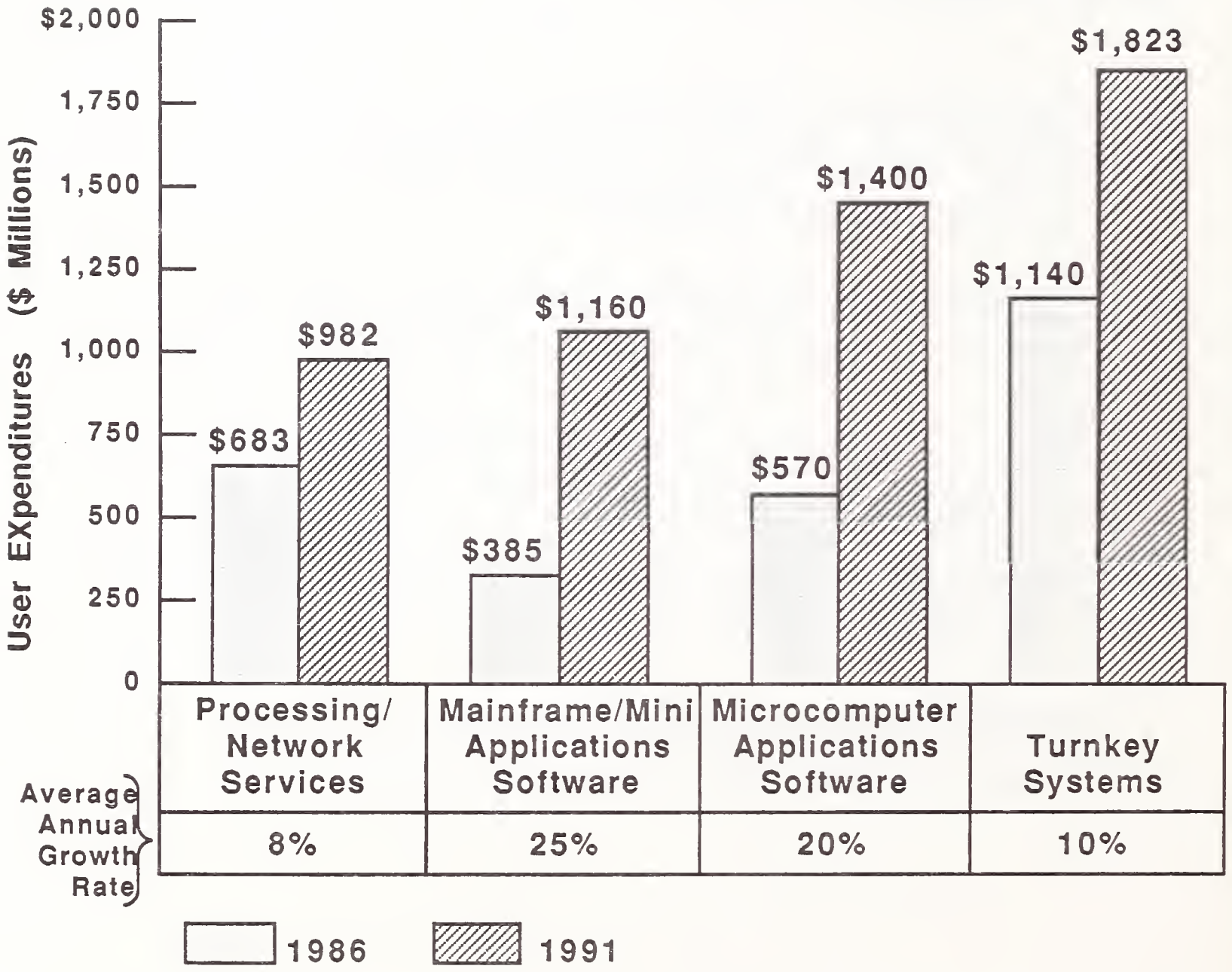

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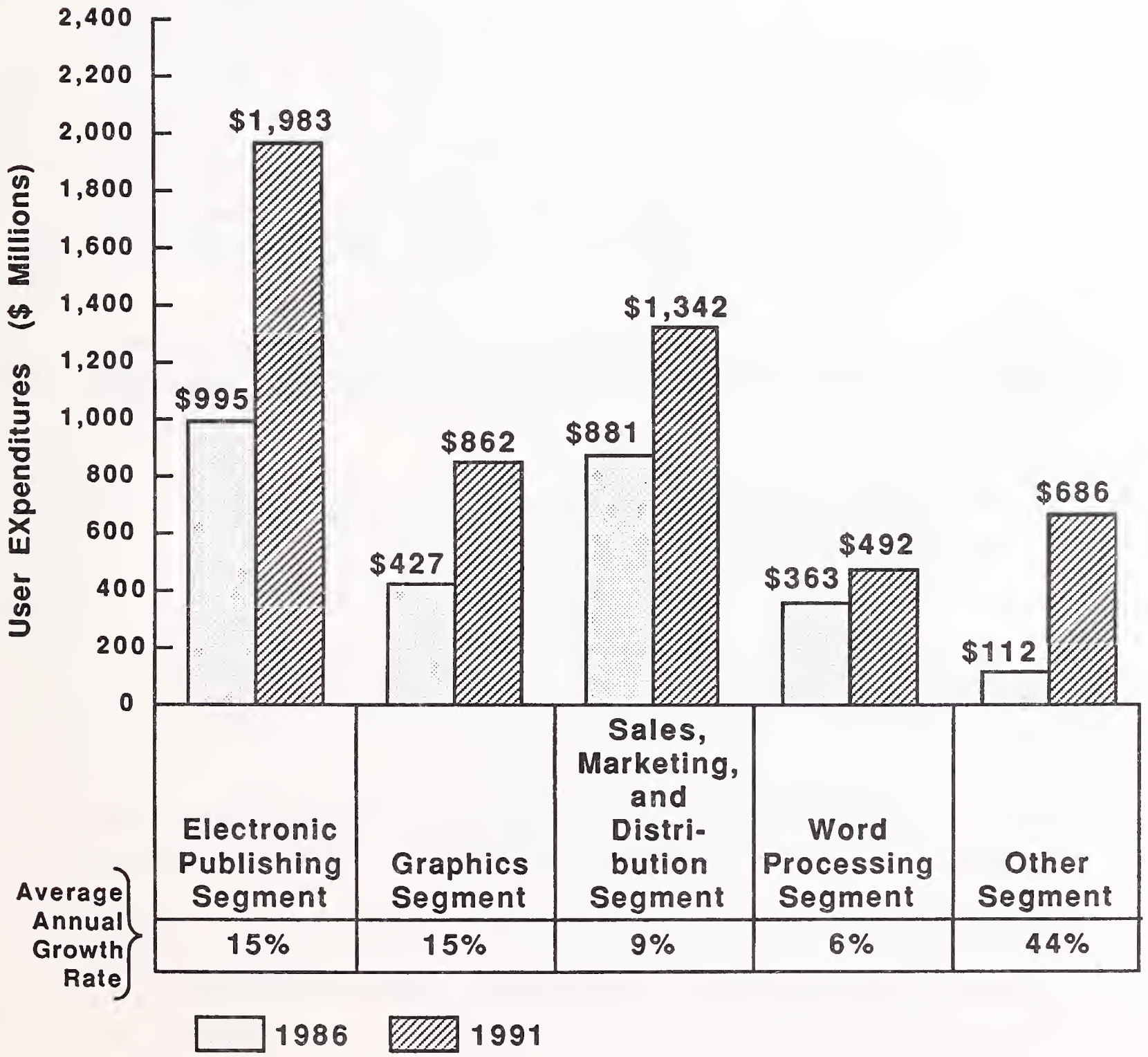
EXHIBIT II-2

OTHER SECTOR MARKET FORECAST COMPARISON
CROSS-INDUSTRY INFORMATION SERVICES
1986-1991



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B. PROCESSING/NETWORK SERVICES

- The application with the largest processing volumes in this sector is direct mail/mail list management.

  - Many companies are turning to direct mail as a low-cost method of reaching customers.

  - Direct mail/list management services can range from computer-generated mailing labels or personalized letters to response analysis and fulfillment tracking.

  - As postage costs increase, users are demanding extra services such as list segmentation to reach narrowly defined audiences and mail list merge/purge to avoid duplicated and outdated listings.

- Mainframe graphics processing services are declining primarily because of advancing technology that provides low-cost and high-quality graphic design at the PC level.

  - Graphics processing services will continue its decline as lower cost slidemaking devices become available.

C. SOFTWARE PRODUCTS

- Software will grow at 22% annually. Mainframe and minicomputer software expenditures will grow at a faster rate than those for the microcomputer market.

- Electronic publishing software expenditures are growing at a high rate.

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- In 1985, the majority of desktop publishing software sold was Macintosh-related from Apple. In 1986, software shipments from other vendors began increasing. Apple will continue to lose market share in this market through this forecast period.

- Software for larger systems will grow at a slower rate because the potential market for such systems is much smaller. Only companies that publish large volumes of long or complex documents really need these systems.

- The growth of the desktop publishing market will negatively impact the microcomputer word processing and graphics software markets.

D. TURNKEY SYSTEMS

- The majority of turnkey systems expenditures are in the electronic publishing segment.

  - In determining the size of the turnkey systems market, all peripheral devices purchased simultaneously with the CPU and electronic publishing software are included.

  - For example, an Apple Macintosh, desktop publishing software, and an Apple LaserWriter purchased at the same time as a complete solution is included in the turnkey systems forecast. However, electronic publishing software purchased for a workstation already installed at the customer site is included in the software forecast.

- The electronic publishing turnkey systems forecast is weighted heavily by Macintosh-based systems.

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- As microcomputer software vendors continue to develop and introduce desktop publishing software for the Macintosh as well as for systems by other manufacturers, the desktop publishing turnkey market will grow at a slower rate.

- Mainframe and minicomputer corporate electronic publishing turnkey systems are not expected to be similarly impacted.

E. ELECTRONIC PUBLISHING

- This segment is showing rapid growth primarily because of the novelty of the application. For details, see Exhibit II-3 and OC-A-2.

  - Electronic publishing expenditures will grow 15% annually, from $995 million in 1986 to $2.3 billion in 1991.

  - Microcomputer software will show the most rapid growth at 43% annually, reaching $507 million in 1991 from a base of $86 million in 1986.

  - Mainframe and minicomputer software will grow from $63 million in 1986 to $157 million in 1991, at 20% annually.

  - User expenditures for turnkey systems will increase at a steady 9% annually from $821 million in 1986 to $1.3 billion in 1991.

- The majority of microcomputer products shipped in 1986 were related to Apple products. However, MS-DOS/PC-DOS products are being introduced at a rapid rate. The MS-DOS market is expected to surpass the Macintosh market by the end of 1987.

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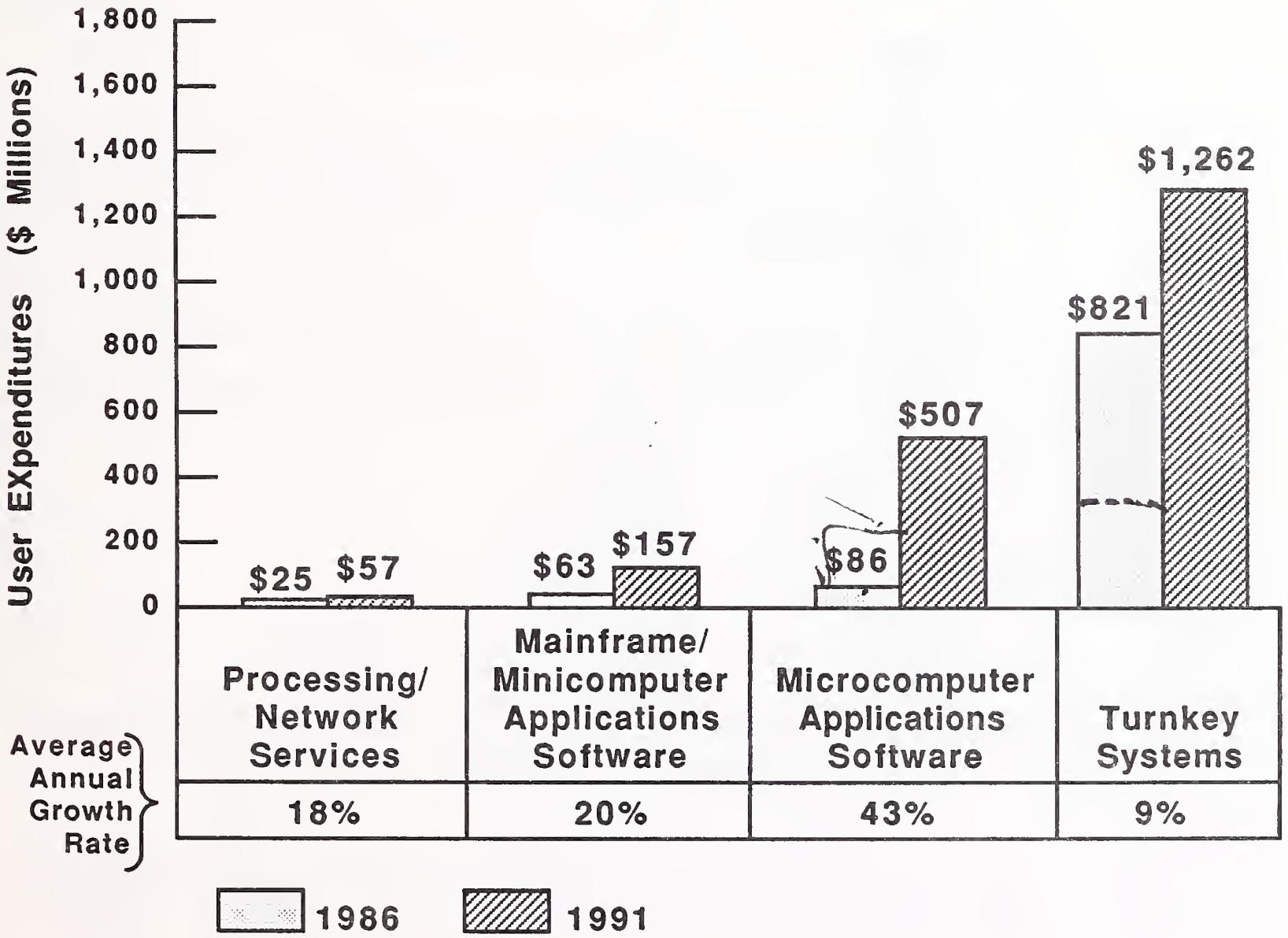
ELECTRONIC PUBLISHING SEGMENT FORECAST
CROSS-INDUSTRY INFORMATION SERVICES
1986-1991



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- Although the number of turnkey systems shipped will grow at a faster rate than 9%, for the following reasons the average price per unit will be lower, resulting in an average annual growth rate of 9% for user expenditures.

  - Competition will increase. As the market continues to grow, more vendors will offer products. Some of the more established vendors will lower prices in order to maintain market share.

  - The prices of laser printers are expected to decrease. Since the laser printer represents from 30% to 60% of the total cost for a desktop publishing system, the impact will be significant.

    . The cost to manufacture laser printers will decrease because of economies of scale and the technological improvements being made in Japan.

- The availability of software that will operate on the installed base of hardware will lower turnkey systems expenditures and increase software expenditures.

F. GRAPHICS

- This segment shows healthy overall growth as the market approaches adolescence, as shown in Exhibits II-4 and OC-A-3.

  - The graphics market will grow at 17% annually, from $221 million in 1986 to $487 million in 1991.

  - Processing services will decline at 2% annually, from $50 million in 1986 to $46 million in 1991.

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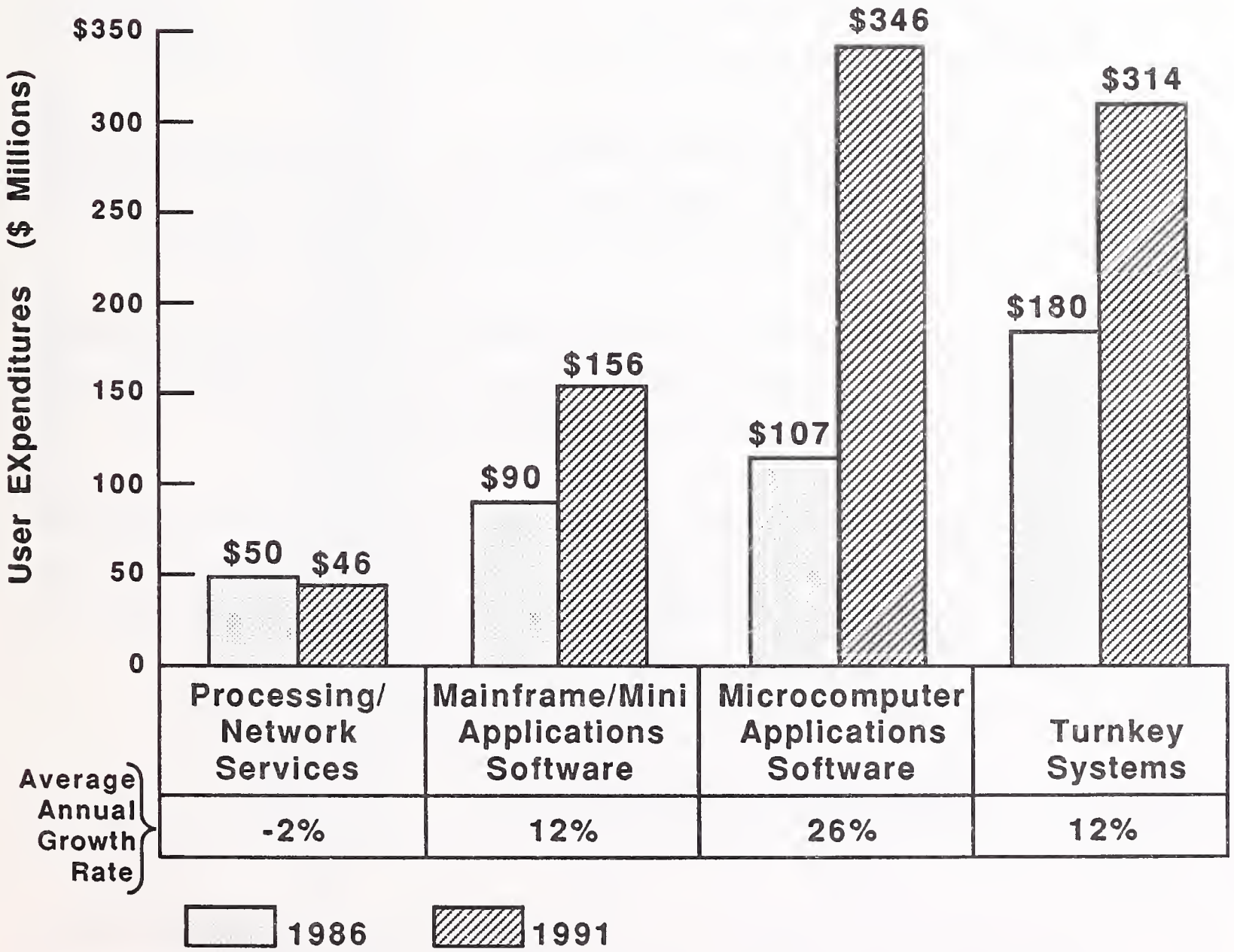
EXHIBIT II-4

GRAPHICS SEGMENT FORECAST
CROSS-INDUSTRY INFORMATION SERVICES
1986-1991



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- Mainframe and minicomputer software will grow steadily at 12% annually to reach $156 million in 1991 from a base of $90 million in 1986.

- Microcomputer software will grow rapidly at 26% annually, from $107 million in 1986 to $346 million in 1991.

- Turnkey systems will show growth at 12% annually from $180 million in 1986 to $314 million in 1991.

- The increasing quality of hardware in terms of sophistication and speed and the decreasing cost of such hardware play a major role in this segment.

- Processing services are declining because users are able to produce quality graphic designs in-house. High-quality monitors, graphic cards, and printers allow in-house production of graphics with a shorter turnaround time.

- The slow rate of decline in graphics processing is primarily due to growing demand for slidemaking services that stem from higher expectations in general for more impressive and sophisticated presentations.

- The microcomputer software market's growth is in part due to increased use by business managers. As more managers become accustomed to using graphics for financial reporting or sales and marketing applications and presentations, the market will continue to grow.

G. SALES, MARKETING, AND DISTRIBUTION

- This segment will continue to show a slow but steady growth rate through 1990 before the growth rate increases, as shown in Exhibits II-5 and OC-A-4.

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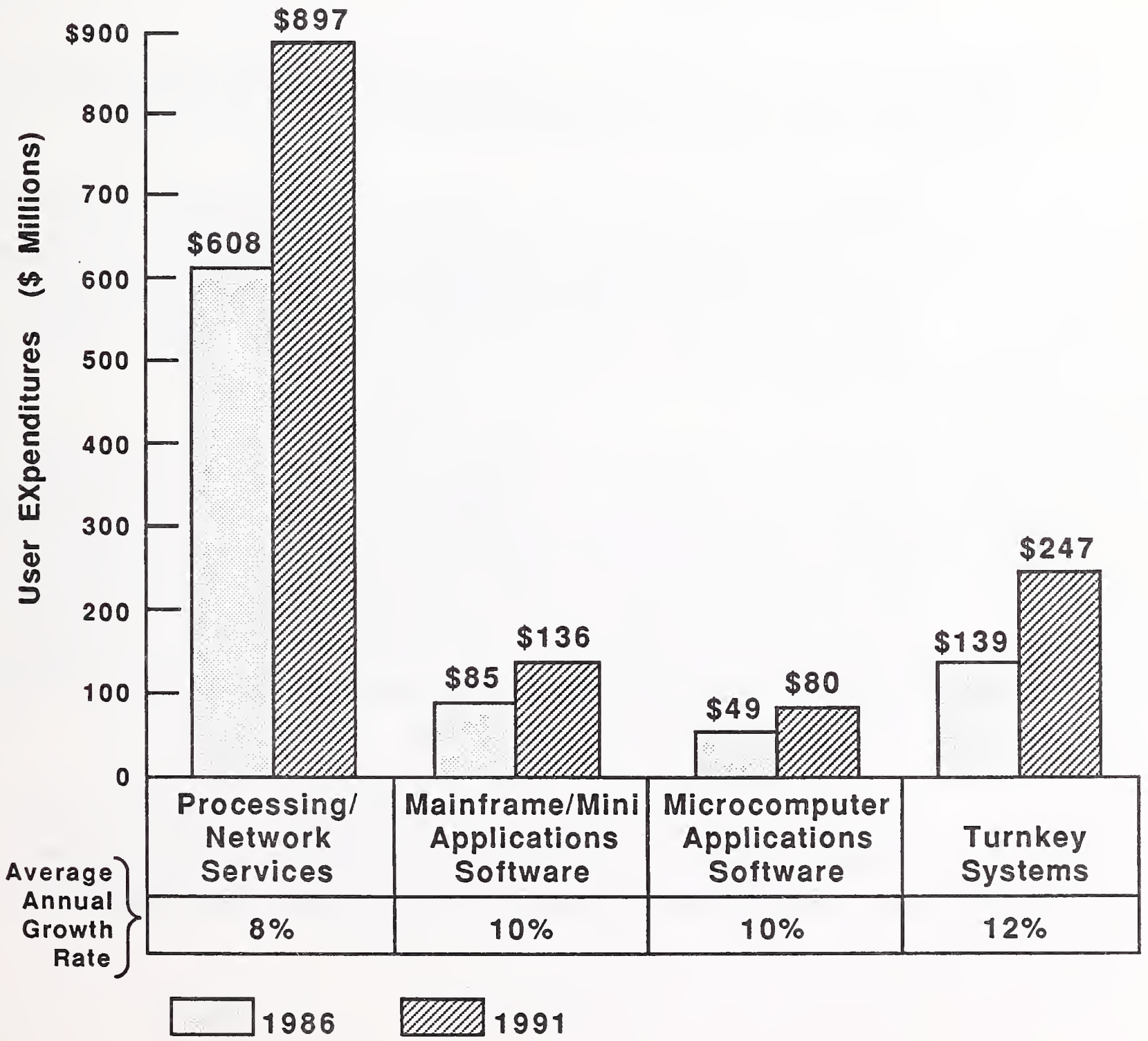
SALES, MARKETING, AND DISTRIBUTION SEGMENT FORECAST
CROSS-INDUSTRY INFORMATION SERVICES
1986-1991



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- Sales marketing and distribution expenditures will grow at 9% annually, from $881 million in 1986 to $1.3 billion in 1991.

- Software will grow at an annual rate of 10% to reach $216 million in 1991 from a base of $134 million in 1986.

- Turnkey systems will grow 12% annually from $139 million in 1986 to $247 million in 1991.

- The sales and marketing market does show potential in the future, but the following reasons dictate its current slow growth:

  - Although many companies are considering or investigating sales and marketing application systems, the selection and evaluation process is very slow and not considered high priority. As a result, purchasing decisions for such systems are often delayed for higher priority projects.

  - There is low motivation to automate sales and marketing functions within most companies. A contrasting example is the insurance industry where insurance companies want to automate their independent agents and brokers. Some of the larger insurance companies provide low-cost financing and other financial incentives on software and turnkey systems to motivate their agents to automate and provide additional productivity.

  - Some decisionmakers are not computer proficient and do not perceive a need to automate. As younger workers who grew up with computers join the sales force, sales and marketing functions will be automated at a faster rate.

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- Because sales and marketing managers have successfully adopted general applications systems such as spreadsheets for sales forecasting, graphics or desktop publishing for proposals and presentation materials, and data base management systems for client data bases and sales tracking, the perceived need for specialized applications is low.

H. WORD PROCESSING

- This segment will grow at a slow rate, primarily because of the slowing growth rate of personal computer shipments, as shown in Exhibits II-6 and OC-A-5.

  - Mainframe and minicomputer software expenditures will decline 7% annually, from $35 million in 1986 to $25 million in 1991.

  - Microcomputer software will increase 7% annually, from $328 million in 1986 to $467 million in 1991.

- Most microcomputer word processing packages will be first-time purchases, although a large part of the market is from upgrading of existing packages or switching from one package to another.

- Mainframe and minicomputer word processing expenditures will be impacted by corporate electronic publishing systems as well as continued migration of word processing functions to the personal computer level.

- Software that allows the uploading of data from PCs to mainframes and minicomputers, especially without having to reformat the data, is in demand.

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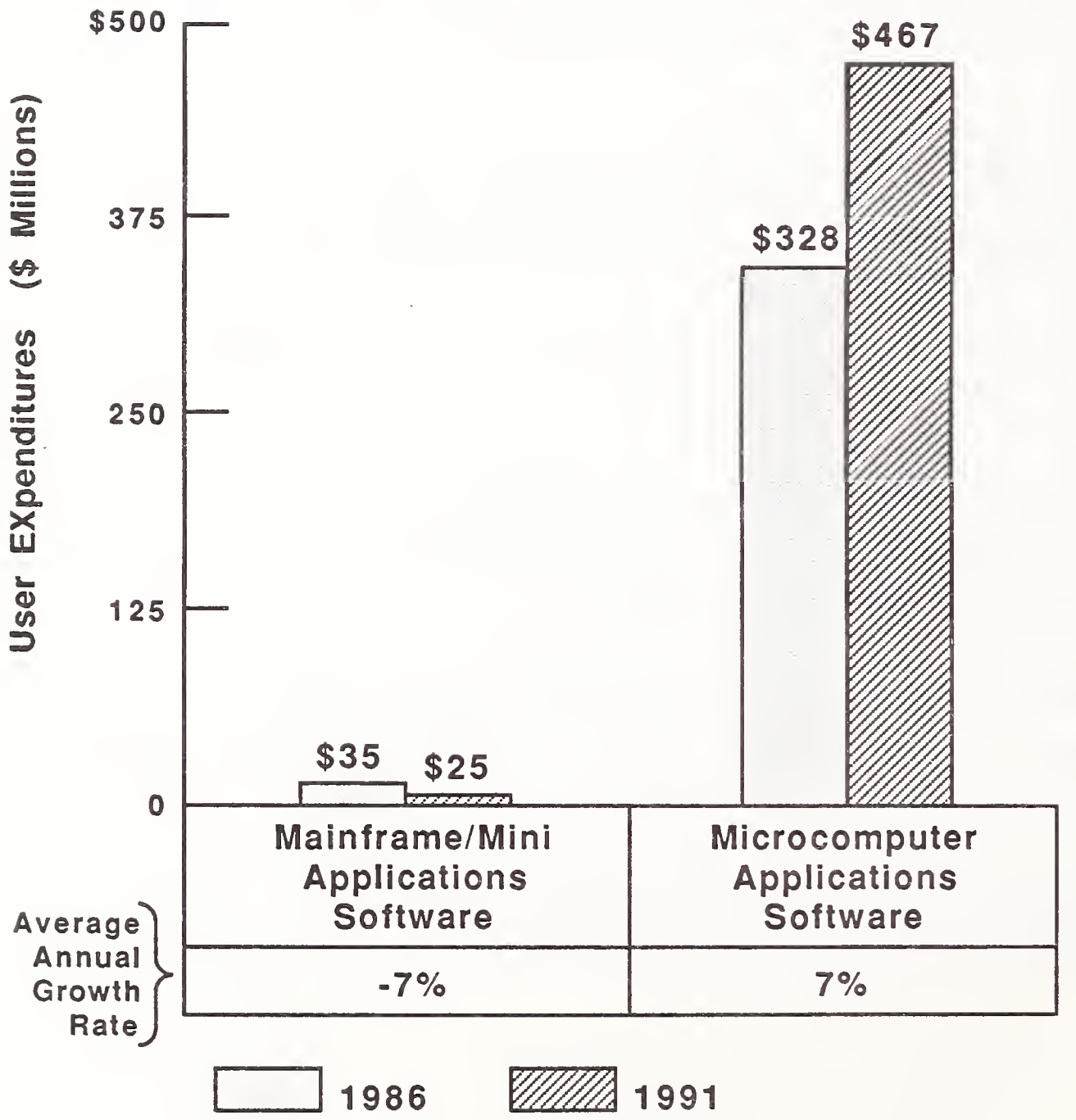
EXHIBIT II-6

WORD PROCESSING SEGMENT FORECAST
CROSS-INDUSTRY INFORMATION SERVICES
1986-1991



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I. MISCELLANEOUS

- The forecast for this segment includes the software to support internal voice mail, based on INPUT's estimate of the value of the software sold as part of a system, internal electronic mail software systems, and integrated office software systems. The balance of electronic mail is included in the remote computing services segment.

- Rapid growth in software expenditures due to advancing technology and increasing user acceptance will be partially offset by a move to voice and electronic mail service bureaus, especially after the RBOCs enter the market.

- Until workable solutions for connectivity between PCs, multivendor systems, and other integrated office systems become available, the market for IOS will show slow growth.

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III COMPETITIVE DEVELOPMENTS

A. INTRODUCTION

- The electronic publishing market is characterized by the following:

  - Corporate electronic publishing: a small number of medium-sized vendors and a larger number of small vendors.

    . Leaders in this market include Interleaf, Camex, Texet, Kodak, Xyvision, and Xerox.

  - Desktop publishing: a pyramid consisting of a few large vendors, several medium-sized vendors, and a multitude of small vendors.

    . Leaders in this market include Apple, Adobe Systems, Aldus, Xerox/Ventura Software, and Software Publishing.

- The graphics market is characterized by a few well established vendors and many small vendors.

  - Leaders in the mainframe and minicomputer market include IBM, SAS Institute, ISSCO, Precision Visuals, SPSS, and Hewlett-Packard.

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- Leaders in the microcomputer market include Decision Resources, Graphic Communications, Microsoft, and Software Publishing.

- The sales and marketing market is made up of many small vendors.

  - Several large vendors dominate the direct mail/mail list management market. These include CCX Network, LCS Industries, MAGI, Metromail, and Wiland Services.

- The distribution market consists of small- to medium-size vendors specializing in distribution applications and several large vendors who include distribution applications in their product lines.

  - Leaders in this market include Distribution Management Systems, Distribution Sciences, GSI Transcomm, American Software, Management Science America, Numerax, and Rand Information Systems.

- The word processing segment includes several well established vendors and many small vendors.

  - Leaders in this market include IBM, Micropro, Multimate, Microsoft, Wordperfect, Software Publishing, Lifetree, and Samna.

- The integrated office systems market is primarily comprised of large hardware manufacturers.

  - Some vendors and systems include IBM's PROFS, DEC's All-in-One, Data General's Comprehensive Electronic Office (CEO), Wang's Wang Office, and Prime's Office Automation Systems (OAS).

- The voice mail segment includes a few major vendors and several smaller vendors.

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- Leaders in this market include Rolm, VMX, Octel, Opcom, and AT&T.

- Additionally, service bureaus using equipment from these vendors have been established.

- Electronic publishing companies have been very successful in attracting venture capital.

  - However, many of these same companies were profitable for the first time in fiscal 1986, and some have yet to show a profit.

  - Several vendors made initial public offerings of stock in 1986.

    . Adobe Systems' stock prices have increased dramatically since its stock began trading in August 1986.

    . Interleaf sold 31% of the company in its IPO in June 1986 after reporting a $2.4 million loss for the fiscal year ended March 31, 1986. Results for the first nine months of fiscal 1987 indicate that Interleaf may be close to breakeven for the year.

    . Xyvision's stock has increased approximately 35% from $13.50 a share since its IPO in October 1985.

- In the graphics market there has been a flurry of acquisitions of leading graphics vendors.

  - In June 1986, Graphic Communications was acquired by Lotus.

  - In September 1986, Decision Resources was acquired by Ashton-Tate.

  - In December 1986, ISSCO was acquired by Computer Associates.

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- Software Publishing acquired Harvard Software in August 1985 and desktop publishing software from T/Maker and Bestinfo in June 1986.

- In December 1986, Pansophic made an offer to acquire SPSS but later decided not to continue negotiations.

B. VENDOR PROFILES

1. ADOBE SYSTEMS INCORPORATED
(1870 Embarcadero Road, Palo Alto, CA 94303)

a. Products/Services

- Adobe designs, develops, and markets systems software used in laser printers, typesetters, and other raster output devices to print integrated text and graphics for electronic printing and publishing applications.

  - The company's principal product, the PostScript interpreter, executes page descriptions generated from application programs that support the PostScript page description language to produce documents containing multiple typefaces and graphics.

  - TranScript, another software product, allows the UNIX-based host composition language, troff (typesetting run off), to drive printers using PostScript.

  - Adobe Illustrator, an application software product introduced in March 1987, is an art production tool for producing high-quality line art and illustrations.

- Adobe also markets PostScript-compatible typeface packages on floppy disks.

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b. Markets Served

- Adobe markets PostScript to computer, printer, and typesetter manufacturers who are original equipment manufacturers (OEMs).

- TranScript and the typefaces are sold to OEMs and end users.

c. Company Strategy

- Since one of Adobe's goals is to promote the PostScript language as an industry standard, Adobe has placed the PostScript language in the public domain.

d. Recent Activities

- In August 1986, Adobe made an initial public offering of 500,000 shares of common stock.

- Fiscal 1986 revenue reached $16 million, a 248% increase over fiscal 1985 revenue of $4.6 million.

e. Future Directions

- Adobe will expand its system software technology into related electronic printing markets and will develop new products for selected end-user markets.

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2. INTERLEAF, INC.
(Ten Canal Park, Cambridge, MA 02141)

a. Products/Services

- Interleaf markets turnkey systems that are based on Interleaf's two software products. Turnkey systems are available in a networked or standalone configuration.

  - Technical Publishing Software (TPS[T.M.]) is designed for use by publication departments or groups that require sophisticated composition and pagination features.

    . A TPS turnkey system includes a 32-bit workstation, a bit-mapped screen, a laser printer, and other peripheral devices. TPS is currently available on workstations manufactured by Sun, IBM, DEC, and Apollo Computer, Inc.

  - Workstation Publishing Software (WPS[T.M.]) is designed for use by workstation users who do not require all the features available on TPS. The typical WPS user has purchased a workstation for some other primary application and acquires WPS as an ancillary documentation tool.

    . WPS is available on 32-bit workstations from most major manufacturers.

- Interleaf also markets its software through original equipment manufacturers (OEMs).

b. Markets Served

- Interleaf markets to two segments of the computer-aided publishing market.

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- TPS is primarily marketed in the technical documentation market to corporations and government agencies. Technical documentation includes designs, drawings, and manuals for commercial products, scientific and engineering reports, and technical bids and proposals.

- Both TPS and WPS are marketed in the office publishing market to manufacturers, banks, insurance companies, investment banking firms, and consulting firms. Office publishing that is enhanced by the integration of graphics and text includes proposals, client reports, brochures, price lists, and memoranda.

c. Company Strategy

- Interleaf follows a strategy of hardware independence, operating on workstations from a variety of manufacturers.

d. Recent Activities

- In June 1986, Interleaf made an initial public offering of three million shares of common stock.

- Fiscal 1987 revenue is estimated at $36 million, an increase over fiscal 1985 revenue of $18.6 million.

e. Future Directions

- Interleaf will continue to develop enhancements and features for its products and to port Interleaf software to additional workstations.

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3. PENTA SYSTEMS INTERNATIONAL, INC.
(309 East Federal Street, Baltimore, MD 21202)

a. Products/Services

- Penta develops, markets, and supports turnkey systems for composition, processing, and electronic pagination of printed materials.

  - Penta's turnkey systems, marketed under the trade name Penta-Modulus, are based on the full line of Data General Eclipse MV hardware and Penta's application software.

  - Penta provides two types of turnkey systems as follows:

    . PentaQuick composition systems automate most of the functions necessary to produce typography.

    . PentaEditorial systems automate most of the functions necessary to edit, analyze, revise, and refine text.

  - Penta offers optional software and hardware and software terminals designed to perform certain specialized text processing tasks for both editorial and composition systems.

    . Text composition products include PentaPage, PentaSaturn, PentaVision, PentaVision+, PentaMath, and PentaPrint.

    . Data base products include PentaBase, PentaSort, PentaLogue, PentaSpell, PentaIndex, and PentaLabel.

    . Telecommunications products include PentaLink, PentaComm, PentaCommpc2, PentaTele/Media, and PentaWord.

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- Networking/distributed processing products include PentaPair, PentaPlus, CEO Interface, and DeltaLink.

b. Markets Served

- Penta sells to two categories of users which include commercial typesetters and businesses with in-house editorial and typesetting requirements.

- Penta also targets vertical markets within each category of users as follows:

  - Commercial typesetting: advertising typesetters, general typographers, and others.

  - General business: manufacturing, insurance, banking/finance, service organizations, printers, and publishers.

c. Company Strategy

- Penta positions its systems as general purpose systems that can be adapted for different uses including commercial typesetting, corporate publishing, technical documentation, and book publishing.

d. Recent Activities

- In May 1986, the trade name PentaModulas was introduced when Penta added a low-end system to encompass the full line of Data General Eclipse MV hardware.

- Revenue in 1986 is estimated at $22 million.

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e. Future Directions

- Penta plans to address the need for software to operate on a variety of computers including personal computers and to develop a better interface for the PC marketplace, using direct interface rather than the translation or conversion systems currently in use.

- Penta also plans to increase and refine its interfaces to output devices, specifically for on-demand printers.

4. DECISION RESOURCES, INC.
(25 Sylvan Road South, Westport, CT 06880)

a. Products/Services

- Decision Resources provides microcomputer graphics applications software products.

  - Decision Resources offers four graphics packages which include CHART-MASTER, SIGN-MASTER, DIAGRAM-MASTER, and MAP-MASTER.

b. Markets Served

- The company markets its software across all industry sectors in the U.S. and internationally through original equipment manufacturers (OEMs) and distributors.

c. Company Strategy

- Decision Resources will continue to develop and regularly improve its product line in order to provide business people with the tools that fulfill their communications needs.

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d. Recent Activities

- Decision Resources was acquired by Ashton-Tate in September 1986.
- Also in September 1986, the company adopted the trade name Master Graphics for its product line.
- In April 1986 Decision Resources began shipping MAP-MASTER.
- Revenue for the 12-month period ending June 30, 1986 was $13 million.

e. Future Directions

- In the near future, Decision Resources plans to introduce products and services that complement and supplement its current line of products.

5. GRAPHIC COMMUNICATIONS, INC.
(200 Fifth Avenue, Waltham, MA 02254)

a. Products/Services

- Graphic Communications, Inc. (GCI) provides microcomputer graphics software products.
- The company offers two packages.
  - Graphwriter creates standard business charts and graphs.
  - Freelance is a freeform graphics package.

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b. Markets Served

- GCI markets its products across all industry sectors.

c. Company Strategy

- The company will continue to promote its products' integration ability between each other, Lotus Development Corporation products, and software from other developers.

d. Recent Activities

- GCI was acquired by Lotus Development Corporation in June 1986. Lotus has introduced Graphwriter and Freelance to its corporate accounts and dealer base.

- Graphic Communications' 1986 revenue is estimated at $9 million.

e. Future Directions

- GCI will continue to concentrate on creating special graphics from spreadsheet data and graphs.

- GCI is also addressing graphics for forms, memos, poster boards, and similar types of visual communication as well as the desktop publishing market.

6. INTEGRATED SOFTWARE SYSTEMS CORPORATION (ISSCO)
(10505 Sorrento Valley Road, San Diego, CA 92121)

a. Products/Services

- ISSCO develops, markets, and supports a family of integrated computer graphics software products for business and scientific applications.

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- ISSCO's software products operate on 32-bit or larger minicomputers or mainframes including Apollo, Control Data, Cray, DEC, Hewlett-Packard, Honeywell, IBM, Perkin-Elmer, Prime, and Unisys.

  . One software product, DISSPLA, has been ported to the 16-bit IBM PC AT.

- ISSCO's family of integrated software, known as IVISS™ (Integrated Visual Information Systems Software), consists of graphics software, system integration software for integrating ISSCO's products with other software and hardware, and applications software for graphic enhancement of other applications. The line of software consists of the following component products:

  . DISSPLA® (Display Integrated Software System and Plotting Language).

  . TELL-A-GRAF® .

  . CUECHART™.

  . THE DATA CONNECTION™.

  . TELLAPLAN® .

  . IVISS MANAGER™.

  . TABLES™.

  . MegaCalc™.

  . DYNAMICS.

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- GKS.
- PINPOINT.
- PC LINK A GRAF.
- CUECHART CHARTBOOK LIBRARY.
- Lotus-to-TELLAGRAF Link.

b. Markets Served

- ISSCO's software products are marketed to large- and medium-size organizations in a variety of industry sectors. The software is used for business or engineering/scientific applications.

c. Company Strategy

- ISSCO plans to incorporate data base software technology in future application products in order to further expand its product line beyond graphics software.

d. Recent Activities

- In June 1986, ISSCO completed its acquisition of a 60% interest in Mimer Information Systems AB, a Swedish developer and marketer of integrated relational data base computer software.
- In December 1986, ISSCO was acquired by Computer Associates International, Inc. for $69.3 million.
- ISSCO's 1986 revenue is estimated at $43 million.

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e. Future Directions

- ISSCO's research and development focus is on mainframe/workstation combinations to allow users to make graphs locally on workstations and then print them out on the graphics output devices that are hooked up to the mainframe.

7. ADELIE CORPORATION
(125 Cambridge Park Drive, Cambridge, MA 02140)

a. Products/Services

- Adelie markets sales and marketing productivity software products and provides consulting and education and training services associated with its software.

- Adelie's primary product is CLOSE, an integrated sales and marketing productivity software system composed of five modules and integrated through the CLOSE marketing data base.

  - The five modules include the Sales System, the Telemarketing System, the Direct Mail System, the Response System, and the Management System.

  - CLOSE operates on IBM 370 and larger computers and the Prime 50 series. CLOSE is also available in a network environment.

b. Markets Served

- Adelie markets its products across all industry sectors. Adelie targets sales and marketing departments within companies that have IBM mainframes, primarily Fortune 1000 companies.

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c. Company Strategy

- Adelie positions itself as the largest company to offer sales and marketing productivity software in the IBM mainframe environment.

d. Recent Activities

- Revenue in 1986 is estimated at $6 million, a 300% increase over 1985 revenue of $1.5 million.

e. Future Directions

- Adelie is developing a version of CLOSE to operate in a distributed processing environment based on IBM mainframes using a UNIX operating system.

8. DISTRIBUTION MANAGEMENT SYSTEMS, INC.
(81 Hartwell Avenue, Lexington, MA 02173)

a. Products/Services

- Distribution Management Systems (DMS) markets applications software packages for warehouse management functions required by medium and large multilocation companies.

- DMS' software products operate on the DEC VAX family of computers (MicroVAX II to 8800) and/or IBM systems (primarily the 4300 and 30XX series).

- The software products are marketed under the name IMPACT. Applications available include the following:

  - IMPACT/Order Management.

  - IMPACT/Warehouse Management.

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- IMPACT/Distribution Center Management.

- IMPACT/Sales Forecasting.

- IMPACT/Distribution Resource Planning.

- IMPACT/Application Expert.

  . OrderEXL[T.M.].

  . SalesEXL[T.M.].

  . Voice EXL[T.M.].

b. Markets Served

- DMS markets its software products to medium and large multilocation companies in various industries, including the automotive aftermarket, pharmaceutical, manufacturing, electronics, utility, chemical, consumer product, and food industries.

c. Company Strategy

- DMS has extended its product line to take advantage of the newest technology--expert systems. By incorporating expert systems technology, DMS positions itself to lead the market in distribution software as the industry matures.

d. Recent Activities

- Fiscal 1986 revenue reached $13 million, a 50% increase over fiscal 1985 revenue of $9 million.

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- In February 1987, Cullinet announced its intention to acquire DMS for approximately $18 million in stock.

9. METROMAIL CORPORATION
(901 West Bond Street, Lincoln, NE 68521)

a. Products/Services

- Metromail provides direct mail list development and enhancement processing services as well as noncomputer services, related mail production, and directory publishing services.

- Metromail maintains a data base of about 78 million U.S. households (more than 90% of total U.S. households).

  - List development services include customized lists and pre-compiled or packaged lists of consumers/households with the common characteristics clients have selected from various criteria categories.

  - List enhancement services include the combining of the client's lists into one list, elimination of duplicates or nonresponders, and correction of addresses and ZIP codes. Items from Metromail's master file, such as telephone numbers, may be added to the client file.

b. Markets Served

- Metromail provides its services primarily to consumer goods manufacturers, magazine publishers, mail order merchandisers, financial service institutions, not-for-profit organizations, and market research firms.

c. Company Strategy

- Metromail will continue selective acquisition of other direct marketing firms.

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- Metromail will add new products and services to appeal to nonseasonal markets in order to increase business in its traditionally lower production periods.

d. Recent Activities

- In January 1985, Metromail acquired Market Development Corporation, a list compilation firm. Its operations have been merged into Metromail's.

- Fiscal 1986 revenue was $86.5 million.

10. WORDPERFECT CORPORATION
(266 West Center Street, Orem, UT 84057)

a. Products/Services

- WordPerfect Corporation provides applications software products for minicomputers and microcomputers.

  - The company's primary product is WordPerfect, a word processing package.

  - Additional products include the following:

    . Student WordPerfect is a student version of WordPerfect.

    . MathPlan is a spreadsheet program.

    . SSIDATA is a data base tool.

    . WordPerfect Library is a collection of programs designed to integrate other WordPerfect Corporation programs and facilitate sharing of data and switching of programs.

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- Features include the shell which is a program manager, a calculator, a file manager, a program editor, a calendar, a notebook, and a macro editor.

b. Markets Served

- WordPerfect markets its products across all industry sector. The company sells to educational institutions and large end-user corporations and through various distribution channels in the U.S. and internationally.

c. Company Strategy

- WordPerfect will continue emphasis on its distribution network. All sales, including those to end-user corporations and educational institutions, are made through dealers and distributors.

- The company also plans to increase emphasis on sales to large corporations.

d. Recent Activities

- WordPerfect rounded out its product line with the introduction of DataBook, a data base management system, in November 1986.

  - The company's WordPerfect word processing system, MathPlan spreadsheet system, and DataBook data base management system can be integrated using WordPerfect Library.

- Revenue in 1986 reached $52.2 milion, a 127% increase over 1985 revenue of $23 million.

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IV NEW OPPORTUNITIES

- Since the electronic publishing market is still in the infancy stage, there are many opportunities for vendors.

  - Barriers to enter this market are not yet unsurmountable since technology in both software and hardware are still evolving and market share for any one particular vendor is still very low.

  - However, vendors may find it difficult to be heard over the noise in this market. Because the market is so new, much attention has been given to electronic publishing, and good sales, marketing, and advertising strategies will play a heavy role in success.

- Freeform graphics is an opportunity for graphics information services. There is a demand for sophisticated systems that allow users to draft art directly on screen.

- An opportunity for vendors specializing in presentation graphics or targeting education and training applications is video graphics systems. This involves combining personal computers, software, video cameras, disk players, and large screen projectors into one system that will merge computer-generated graphics with live or recorded video images.

- In the sales, marketing, and distribution arena, list management processing services that integrate with data base management systems (marketing data base systems) are in demand.

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- The U.S. Postal Service's new national change of address file presents new opportunities for mail list management vendors. The new file will provide these vendors with a major resource to track current customers as well as identify prospects for mailings.

- Telemarketing systems that address the growing interest in telephone sales and marketing is another opportunity.

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APPENDIX OC-A: FORECAST DATA BASE

- This appendix contains the following forecast information, as shown in Exhibits OC-A-1 through OC-A-6.

  - Market size by delivery mode for each year from 1985-1991.

  - Market growth rate for 1985-1991.

  - Average annual growth rate (AAGR) for each delivery mode for the five-year period 1986-1991.

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EXHIBIT OC-A1

OTHER CROSS-INDUSTRY USER EXPENDITURE FORECAST BY DELIVERY MODE, 1986-1991

DELIVERY MODE	($M) 1985	Percent Growth 1985-1986	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	Percent AAGR 1986-1991
Processing/Network Services	651	5	683	725	778	841	910	982	8
Applications Software									
- Mainframe/Mini	311	24	385	493	627	785	967	1,160	25
- Micro	460	24	570	708	890	1,054	1,213	1,400	20
Total Applications Software	771	24	955	1.201	1,517	1,830	2,180	2,560	22
Turnkey Systems	1,042	9	1,140	1,245	1,347	1,480	1,632	1,823	10
Total	2,464	13	2,778	3,171	3,642	4,160	4,722	5,365	14

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EXHIBIT OC-A2

OTHER CROSS-INDUSTRY SECTOR
ELECTRONIC PUBLISHING

SEGMENTATION BY DELIVERY MODE	($M) 1985	Percent Growth 1985-1986	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	Percent AAGR 1986-1991
Processing/Network Services	20	25	25	30	36	43	50	57	18
Applications Software									
- Mainframe/Mini	50	26	63	82	105	122	139	157	20
- Micro	50	72	86	152	256	334	422	507	43
Total Applications Software	100	49	149	234	361	456	561	664	35
Turnkey Systems	749	10	821	897	968	1,057	1,147	1,262	9
Total	869	14	995	1,161	1,365	1,556	1,758	1,983	15

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EXHIBIT OC-A3

OTHER CROSS-INDUSTRY SECTOR GRAPHICS

SEGMENTATION BY DELIVERY MODE	($M) 1985	Percent Growth 1985-1986	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	Percent AAGR 1986-1991
Processing/Network Services	48	4	50	51	50	49	48	46	-2
Applications Software									
- Mainframe/Mini	80	13	90	102	114	127	141	156	12
- Micro	78	37	107	143	187	239	287	346	26
Total Applications Software	158	25	197	245	301	366	428	502	21
Turnkey System	165	9	180	197	215	240	273	314	12
Total	371	15	427	493	566	655	749	862	15

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EXHIBIT OC-A4

OTHER CROSS-INDUSTRY SECTOR
SALES, MARKETING, AND DISTRIBUTION

SEGMENTATION BY DELIVERY MODE	($M) 1985	Percent Growth 1985-1986	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	Percent AAGR 1986-1991
Processing/Network Services	583	4	608	644	692	749	812	879	8
Applications Software									
- Mainframe/Mini	78	9	85	93	102	112	123	136	10
- Micro	45	9	49	53	58	64	70	80	10
Total Applications Software	123	9	134	146	160	176	193	216	10
Turnkey Systems	128	9	139	151	164	183	212	247	12
Total	834	6	881	941	1,016	1,108	1,217	1,342	9

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EXHIBIT OC-A5

OTHER CROSS-INDUSTRY SECTOR
WORD PROCESSING

SEGMENTATION BY DELIVERY MODE	($M) 1985	Percent Growth 1985-1986	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	Percent AAGR 1986-1991
Applications Software									
- Mainframe/Mini	38	-8	35	32	30	28	26	25	-7
- Micro	287	14	328	360	389	417	434	467	7
Total Applications Software	325	12	363	392	419	445	460	492	6
Total	325	12	363	392	419	445	460	492	6

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EXHIBIT OC-A6

OTHER CROSS-INDUSTRY SECTOR
MISCELLANEOUS

SEGMENTATION BY DELIVERY MODE	($M) 1985	Percent Growth 1985-1986	($M) 1986	($M) 1987	($M) 1988	($M) 1989	($M) 1990	($M) 1991	Percent AAGR 1986-1991
Applications Software - Mainframe/Mini	65	72	112	184	276	396	538	686	44
Total Applications Software	65	72	112	184	276	396	538	686	44

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APPENDIX OC-B: FORECAST RECONCILIATION

- This appendix contains the following information:

  - Exhibit OC-B-1 indicates the changes made in the 1986 forecast compared to the 1985 forecast.

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EXHIBIT OC-B1

OTHER CROSS-INDUSTRY DATA BASE
RECONCILIATION OF
MARKET FORECAST BY DELIVERY MODE

DELIVERY MODE	1985 Market			1990 Market			1985-1990 Percent AAGR Forecast in 1985 Report	1986-1991 Percent AAGR Forecast in 1986 Report
	($M) 1985 Forecast	($M) 1986 Report	Variance as Percent of 1986 Report	($M) 1985 Forecast	($M) 1986 Forecast	Variance as Percent of 1986 Forecast		
Processing/Network Services	372	651	-43	710	910	-22	14	8
Application Software								
- Mainframe/Mini	170	311	-45	364	967	-62	16	25
- Micro	386	460	-16	950	1,213	-22	20	20
Total Applications Software	556	771	-28	1,314	2,180	-40	19	22
Turnkey Systems	1,089	1,042	5	2,230	1,632	37	15	10

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About INPUT

INPUT provides planning information, analysis, and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, communications, and office products and services.

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Formed in 1974, INPUT has become a leading international planning services firm. Clients include over 100 of the world's largest and most technically advanced companies.

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U.S. Information Services Industry-Specific Markets, 1987-1992
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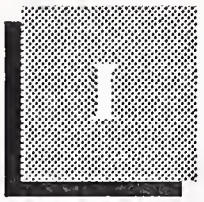

Issues, Trends, and Events

A Introduction

The applications included in the Planning and Analysis sector forecasts are:

- Spreadsheets (e.g., Lotus 1-2-3, SuperCalc, Excel)
- Decision support systems (DSS) (e.g., System W)
- Financial modeling tools
- Budgeting and forecasting tools
- Project management
- Integrated software (e.g., Symphony and Framework)
- Operations research

"Decision support systems" (DSS) is a somewhat flexible term that can mean a number of different things. For the purposes of this report, decision support systems include:

- Spreadsheets, such as Lotus 1-2-3 and SuperCalc
- Financial modeling and analysis tools
- All-in-one integrated software; i.e., Symphony and Framework
- "Traditional" DSS tools, such as Express IFPS, and System W, that include all or most of the following: data base capabilities, report generator, graphics, query facility, programming language, "what-if" capability, and statistical analysis capability

Clarifications to the planning and analysis applications included in this sector's forecasts are as follows:

- Cross-industry DSS tools are included while industry-specific DSS tools are not, since the latter are contained in each vertical market sector forecast of user expenditures.

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- Excluded from the analysis and forecasts are analysis systems related to CAD/CAM/CAE.

- The majority of expert systems and expert system generators are excluded from the forecasts and analysis in this section. The great majority of expert systems will be developed for industry-specific applications or for specific cross-industry applications, such as accounting or human resources, and, as such, are included in each relevant section. In addition, expert system generators are considered to be application development tools and are included in that sector.

- On-line data bases are not included in either the forecasts or analysis for this sector. Rather, they are forecast in their own section.

A number of factors are contributing to the health of the Planning and Analysis sector:

- Technology advances in both hardware and software are enabling previously simple planning/analysis systems to evolve into not only decision support systems, but also decision-making systems. Continued advances in artificial intelligence techniques will enable both knowledge-based and expert systems to become increasingly commonplace by the late 1980s.

- The overwhelming success of Lotus 1-2-3 has introduced over two million users to the power of microcomputing, with the attendant market potential for selling add-on products and services.

- User demand for micro-mainframe links has resulted in numerous hardware and software offerings that make it easier to extract data from a central data base and download it to a PC for local analysis.

B

Decision Support Systems

"Decision Support Systems" means different things to different people. On the narrow end, DSS is defined as an interactive, computer-based system that supports executives and managers in making unstructured decisions. On the other end of the spectrum, DSS has been defined as any system that supports decisions. The primary objective of DSS is to achieve higher-quality decision making.

Traditional DSS products are for computer users who have outgrown their spreadsheets or need ready access to mainframe data files. Although DSS packages and financial modeling programs have a very solid niche in the Fortune 1000, these sophisticated products will never take over the market because although they may provide greater performance and functionality, the majority of computer users have become very attached to products such as Lotus 1-2-3.

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An area that continues to intrigue vendors is executive information systems (EIS). The need for corporate executives to know is among the driving forces behind executive information systems, a promising market that has not yet fully developed. The process of installing an EIS system uncovers issues of data ownership and data management that corporations never realized existed. Such complexities seem to have a slowing effect on the penetration of EIS into corporate America.

Further, this market has been held back by the reluctance of executives to embrace computer technology, a situation partially due to the lack of systems that truly address their needs. These needs include:

- Timely access to data from a variety of sources
- Data manipulation and reporting capabilities
- Customized graphics
- Timely distribution of information
- Convenient and personalized access
- Pushbutton access to analysis, "what-if," and ad hoc reporting

The main trends in traditional DSS include:

- The merger of DSS and data bases which will provide greater access to information contained in various corporate data bases. This greater integration will allow DSS to become more widely used, as opposed to the relatively isolated usage it has found to date. Traditional DSSs handle importing data from data bases much more easily and capably than spreadsheets.

- The range of solutions offered by DSS has expanded beyond the financial modeling systems that have historically defined this category, and the range of users seeking to tap into automated aids to decision making is growing as well.

- The movement from the mainframe to the PC continues with the most successful products being those well-designed implementations of a mainframe version that allow the PC and mainframe to share data and processing load easily.

- Mainframe systems are enjoying a resurgence in popularity, spurred by the need to tie in to large data bases, the need for more graphics, and easier-to-use interfaces for mainframe products.

- The ease of use and user interface of DSS products have been improving.

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In the spreadsheet market, a number of new products have been released, but none has successfully challenged Lotus's hegemony in the market. Although Lotus still dominates the micro spreadsheet market, it is being seriously challenged by three types of competitors: those that are significantly less expensive than 1-2-3, no-frills spreadsheets, and Lotus clones. The challengers include:

- Low-cost clones of 1-2-3, such as VP-Planner from Paperback Software. These work-alikes have had a negligible impact on sales of 1-2-3. Priced in the $100-150 range, they have been beset with bugs, sloppy implementations, and a genuine concern on the part of customers about the financial viability of the companies supplying these products.

- Microsoft's Excel, developed for the Macintosh. This has been widely touted as the "best" spreadsheet available (with some validity) for any personal computer, including the IBM PC. While it quickly developed into the best-selling spreadsheet for the Macintosh (easily leaving Jazz and Crunch in its wake), it still only maintains sales that are a fraction of 1-2-3's.

- Javelin, although it has generated a great deal of excitement for its elegant and innovative design, has failed to generate a commensurate level of sales. This product, which the company describes as a "business analysis and reporting tool," has carved out a strong niche among certain segments of the spreadsheet market, such as financial analysts and other sophisticated users who are involved with developing complex financial models. There is no danger that Javelin will displace Lotus 1-2-3 in the market for general purpose spreadsheets.

- So-called "three-dimensional" spreadsheets from such vendors as Boeing Computer Services and Martin Marietta Data Systems. These products allow multiple spreadsheets to be linked easily and efficiently. Although these products definitely fulfill a need among a number of users in large corporations, such as for consolidating spreadsheets from a number of divisions or product lines, the market they address has been slow to respond.

Although it is inevitable that Lotus will lose some market share, the decline will be gradual at most. In fact, Lotus has a rock-solid hold on the spreadsheet market for at least the remainder of the decade. The reasons that Lotus 1-2-3 will maintain the position of being the most entrenched product in the history of microcomputing (with the possible exception of MS-DOS) include:

- The recently released and upcoming products and services from Lotus that are designed to support the use of 1-2-3.

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- A historically strong management team that has been made even stronger and deeper.

- The support of hundreds of third-party developers who develop useful add-on products for 1-2-3.

- The reluctance of users to convert to another product, primarily due to the critical mass of Lotus 1-2-3 usage that has been developed in corporations. Users have made very sizeable investments in training, the creation of data files, and the creation of worksheets and templates.

- Most intriguing, the introduction of HAL. HAL, a natural language interface for 1-2-3 released by Lotus in the fall of 1986, has the potential to lock out the majority of competing spreadsheet vendors from the market completely. HAL provides Lotus 1-2-3 with an interface that offers a combination of functionality and ease of use that will remain unmatched by any microcomputer software product for some time to come.

Though smaller in number, the mainframe spreadsheet is gaining acceptance among end users as a legitimate alternative to its PC counterpart. Mainframe-based spreadsheets offer three key advantages over PC-based spreadsheets: the ability for users to access mainframe data bases directly, the virtually unlimited capacity of a spreadsheet using mainframe resources, and the capability for mainframe users to share information and spreadsheet models from a common source.

C

Project Management

Project management software has made significant strides in recent years. Programs are easier to learn and use; speed, capacity, and graphics have been improved; and connectivity issues are being addressed by most vendors.

However, the market for project management software has not taken off because of users' misconceptions of what the program can do and the complex training issues involved. Making effective use of project management software requires considerable learning of both the science of project management and the software's functions. In brief the "fear of flying" has kept this market grounded.

Connectivity will continue to be a major concern. In most information environments the data in a typical data base is shared with other data bases. Vendors have responded by developing software with import and export capabilities.

End users are increasingly looking at "one-vendor solutions" for their choice of project management software. Traditional vendors who have offered mainframe-based software have responded by introducing PC-based versions.

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Trends that favor the growth of project management systems include:

- A broadening awareness of project management techniques brought about by the availability of micro-based project management software.
- Relatively low penetration of project management systems in some key user industries.
- Project management techniques that are beginning to spread to organizations that have not historically been managed under a project-oriented structure and that are being applied to smaller-scale projects. This widening of applications can be attributed to the availability of powerful micro-based project management software.
- A few years after the first limited-function microcomputer project management packages were introduced, more sophisticated, higher-cost microcomputer packages were introduced by vendors such as Primavera and Strategic Software Planning Corporation. These higher performance microcomputer packages have attracted many users away from mainframe and minicomputer solutions.
- One of the biggest problems with using micro-based project management has been the inability to get data from applications such as dBase III and Lotus 1-2-3. Consequently, a number of microcomputer software project management vendors are providing a direct interface with these applications. Examples of programs that have recently added this capability include Timeline, Primavera, and the Total Project Manager.

Trends that will slow the growth of the market include:

- One of the problems in selling project management is that it requires a face-to-face selling effort to sell the package effectively.
- There are few new applications that have large projects to make up for the growing saturation in the aerospace/defense and other large-project markets.
- The need to educate customers on project management techniques.
- Long selling cycles—six to eight months for large systems; several months for micro-based systems.

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II

Market Forecasts

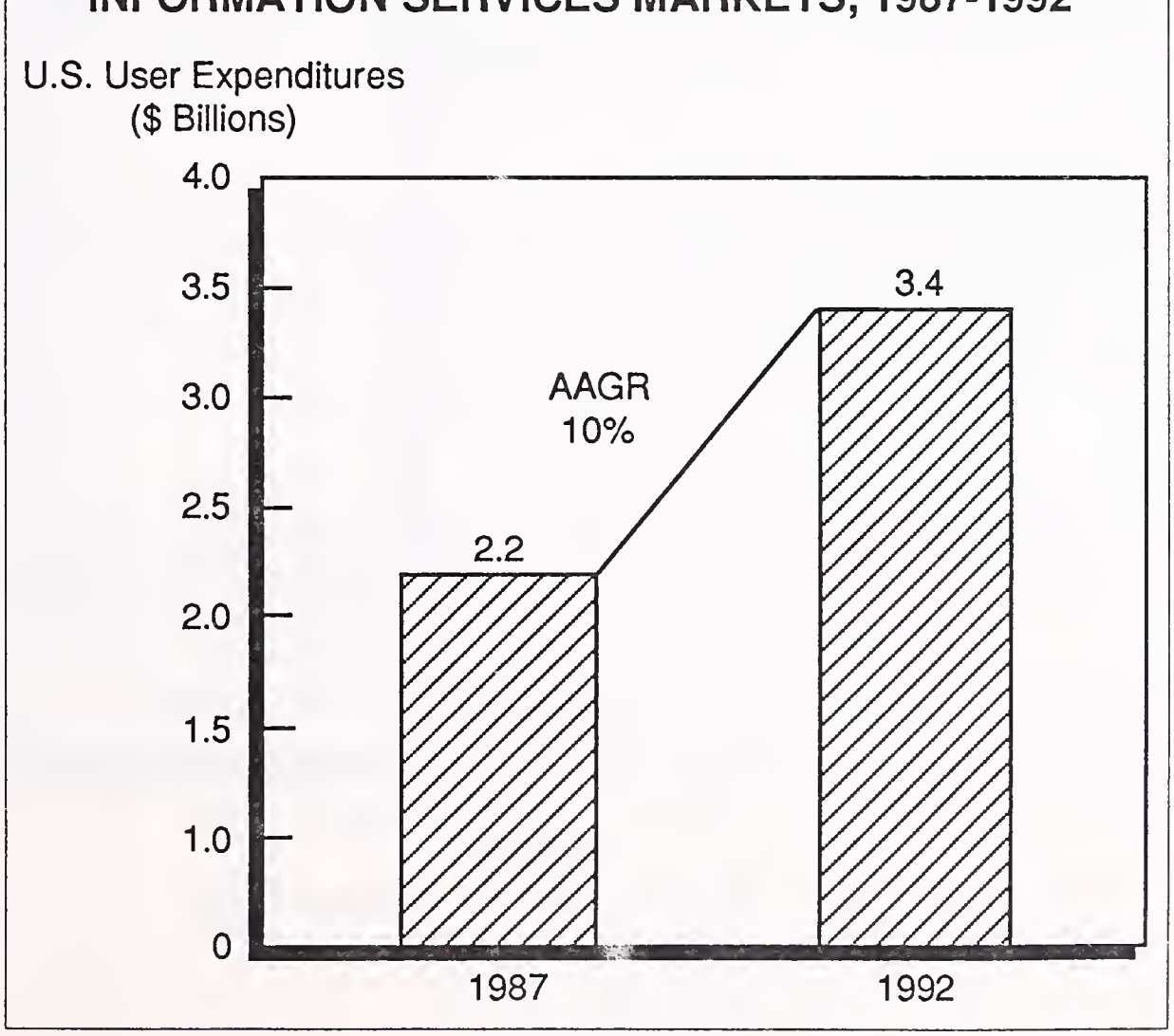
A

Introduction

User expenditures for cross-industry planning and analysis applications will grow at a moderate 10% average annual growth rate through 1992, increasing from $2.2 billion in 1987 to $3.4 billion in 1992, as shown in Exhibit II-1.

EXHIBIT II-1

PLANNING AND ANALYSIS SECTOR INFORMATION SERVICES MARKETS, 1987-1992



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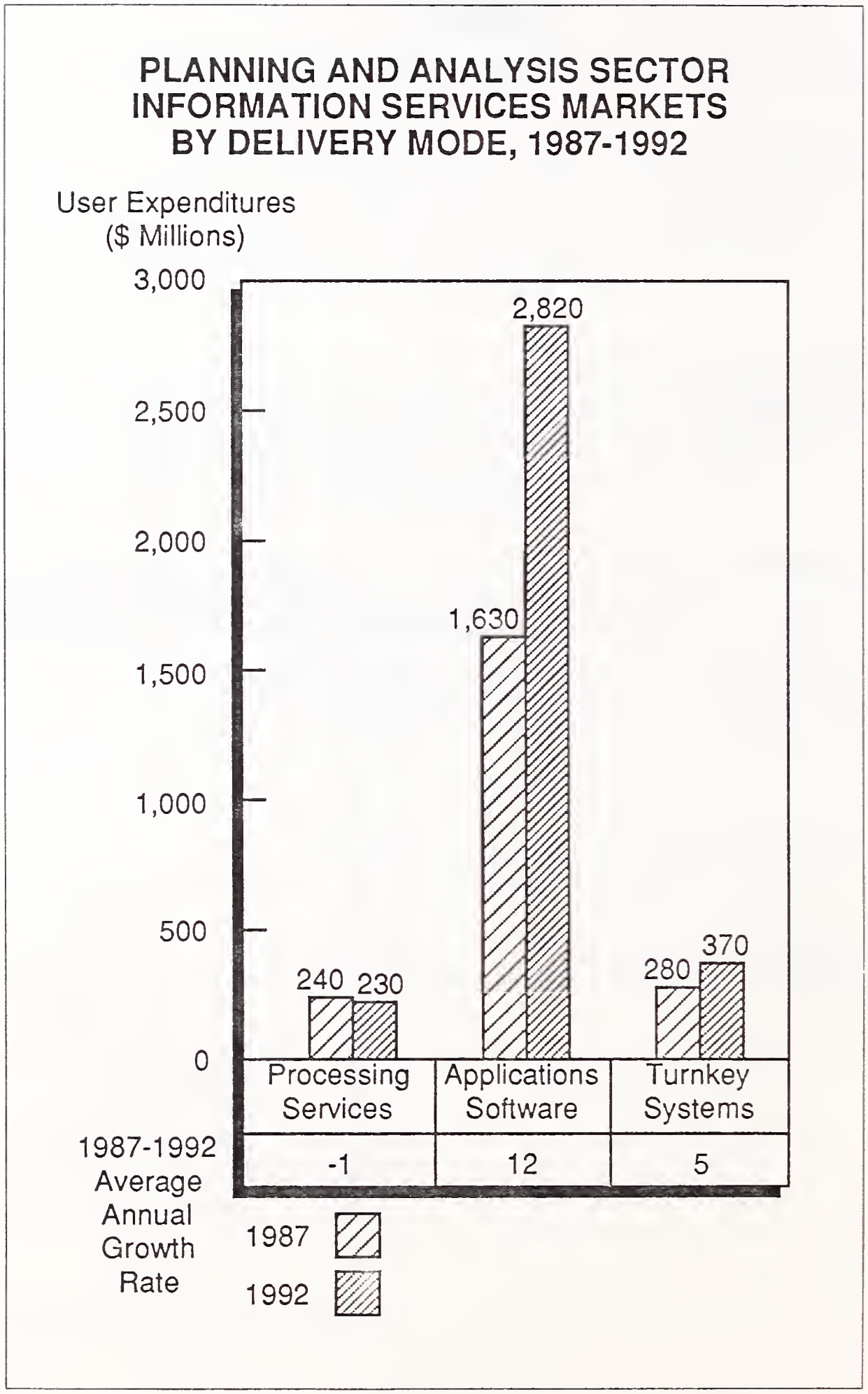
Forecasts for user expenditures by delivery mode are shown in Exhibit II-2.

EXHIBIT II-2



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Appendix PA-A contains the forecast data base for each year from 1986 through 1992 by delivery mode.

Positive factors influencing this market include:

- More powerful microcomputer hardware
- Improved micro-mainframe links for easier access to large data bases and for faster dissemination of results
- Improved integration of planning and analysis systems with transaction processing systems

Negative factors influencing this market are:

- Users are unwilling to learn new systems if their current system is believed to be adequate.
- The increased "verticalization" of most general purpose planning and analysis applications, such as DSS and project management, while certainly a positive trend for vendors, has a negative implication for INPUT's cross-industry planning and analysis forecasts. The move to industry-specific applications means that the growth areas in the market will not appear in the forecasts for planning and analysis; rather, they will be shifted to the appropriate vertical market.

B

Processing Services

The proliferation of fully featured, competitively priced, PC-based DSS packages has had a dramatic impact on remote computing services. PC-based DSSs have provided a ready alternative to remote computing services for small firms or new users just entering the market for a DSS. It's easier than ever before for a small- to medium-sized company to buy a small decision support system.

Processing service vendors are moving increasingly to provide on-line data base services in conjunction with their DSS services. Note: The growth in the market for on-line data bases is part of a separate forecast and is not included in the Planning and Analysis market forecast.

About 10 remote processing service companies offer project management services, but most have de-emphasized this service in the wake of declining sales.

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C

Spreadsheets

The factors contributing to the growth of user expenditures for spreadsheets include:

- New users who will be attracted by the HAL natural language interface
- Templates, add-ons, custom consulting services, and other services for 1-2-3 that will extend its life
- The ability of "clone" vendors to sell to users who desire their own copy of a spreadsheet rather than being forced to "share" a copy of 1-2-3
- Micro-mainframe links that increase the usefulness of PC-based spreadsheets

The factors that negatively impact user expenditures for spreadsheets include:

- Saturation in the market
- Downward pricing pressures from low-priced clones
- Site licensing plans which lower the per-unit price of software
- Increased sales of all-in-one integrated software that reduces the need to buy a separate spreadsheet

Consequently, the net result will be flat sales for spreadsheets in the U.S. with the only growth coming from overseas markets. However, related add-on products and services for spreadsheets (primarily Lotus 1-2-3) offered by either Lotus or other firms will continue to show strong growth.

D

Decision Support Systems

The main factor spurring growth of traditional DSS software is the increased development of connected computing systems in the form of micro-mainframe links, LANs, and distributed processing networks. Greater access to data will drive greater demands for tools to analyze the data.

Other factors positively impacting the market for traditional decision support systems include:

- Artificial intelligence technologies to improve the power and ease of use, and consequently the attractiveness, of current DSS applications. Most of the current product development in DSS with respect to artificial intelligence is taking place in the user interface area with natural language interfaces, particularly in ad hoc data retrieval applications.

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- Improved networking and micro-mainframe communications, which will stimulate the growth to larger-scale, organization-wide DSS applications.

The main factor slowing growth of traditional DSS software is that users are reluctant to learn new systems.

Other factors negatively impacting the market for traditional decision support systems include:

- Because of constantly improving price/performance of all ranges of hardware and increased power of applications software, remote computing services and batch processing will continue to lose ground to in-house solutions. However, market opportunities still exist for the processing of very large data bases with their attendant retrieval and analysis requirements.

- The market is becoming mature.

E

Project Management

The aerospace and defense industries have been behind much of the brisk growth of project management turnkey systems growth. However, this market is reaching saturation. Areas where there is still room for growth include contract construction, high technology manufacturing, and management of R&D labs. These untapped opportunities exist because micro-based project management systems make the use of project management techniques in smaller projects more feasible.

The growth in traditional turnkey systems, as well as mainframe and minicomputer software, has slowed while growth in micro-based project management continues to grow rapidly.

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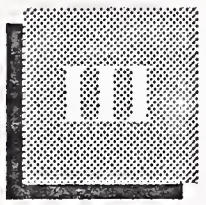

Competitive Developments

A Introduction

The vendors offering products and services in the planning and analysis arena range from leading software vendors like Microsoft and Lotus to smaller companies such as Metier Management Systems and Project Software and Development that are major vendors in a market niche. Many vendors have used alliances and marketing agreements with other vendors, and to a lesser extent mergers and acquisitions as strategies to penetrate this market.

B Vendor Profiles

1. AGS Management Systems, Inc. (880 First Avenue, King of Prussia, Pennsylvania 19406)

a. Products/Services

AGS Management Systems, a division of AGS Computers, Inc., provides micro- and mainframe-based project management software, and planning, training, and consulting services. The company's product line includes PAC I, PAC II, PAC III, PC/70, and WINGS project management systems, and SDM/70 and SDM/STRUCTURED methodologies.

b. Company Strategy

The company leverages the expertise of AGS Computers in custom programming to provide extensive support services, including integrated installation planning, product-specific and skills-development training, and consulting.

c. Recent Activities

In February 1987, AGS Management Systems announced a new release of its WINGS project management software.

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In April 1987, the company announced MULTI/CAM, a micro/mainframe-based computer-aided systems engineering (CASE) workstation.

2. Ashton-Tate Corporation (20101 Hamilton Avenue, Torrance, California 90502)
Revenue (FYE 1/31/87): $210.8 million

a. Products/Services

Ashton-Tate develops and markets microcomputer software products. The company markets the following programs: dBase III Plus, dBase Mac, Rapidfile and dBase Direct/36 in data base management systems, Multimate Advantage II and Multimate Advantage II LAN in word processing, the Master Graphics Series in business graphics, Framework II in integrated software, and Byline in desktop publishing.

b. Company Strategy

Ashton-Tate's strategy is to diversify horizontally and add new products to its product line. The company anticipates that revenues from data base products will decline as a percentage of total revenues, while revenues from other application areas will increase.

c. Recent Activities

In 1987 Ashton-Tate released several new products and new versions of its current products. These include dBase Mac, a data base management system for the Apple Macintosh; Multimate Advantage II; and RapidFile.

In June 1987, Ashton-Tate and Dun & Bradstreet (New York, NY), in a joint venture, introduced Dun's Sale Search, a data base management program for analyzing sales and tracking accounts.

In July 1987, Ashton-Tate introduced its Master Graphics Presentation Pack, a software package that combines three graphics management functions—Chart-Master, Sign-Master, and Diagram Master with a common menu interface.

In August 1987, the company announced Byline, an IBM PC desktop publishing software product.

In September 1987, Ashton-Tate introduced Multimate Advantage II LAN, a local area network (LAN) version of its word processing product.

In October 1987, Ashton-Tate unveiled dBase Direct/36, a connectivity software package that links dBase III Plus with the IBM System/36.

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d. Future Direction

The company claims that growth will come from internally developed products, as opposed to acquired software. The challenge before Ashton-Tate is to develop versions of its software products for a new generation of operating systems and machines including OS/2 operating system and computers based on Intel's 80386 microprocessor.

In five years Ashton-Tate plans to be a solutions-oriented company with revenues of $1 billion.

3. Computer Associates International, Inc. (711 Stewart Avenue, Garden City, New York 11530)
Revenue (FYE 3/31/87): $309.3 million

a. Products/Services

Computer Associates International develops and markets a wide range of systems software, applications software, data base management systems, and microcomputer software products for mainframes, minicomputers, and microcomputers.

Computer Associates is organized into four divisions: Systems Products Division, Applications Products Division, Micro Products Division, and International Products Division. The Micro Products Division offers software products in five categories: project management, spreadsheet, word processing, data base management systems, and financial accounting.

b. Company Strategy

Computer Associates' business strategy is to address the needs of corporate data processing with a broad range of software products with emphasis on product integration.

c. Recent Activities

In May 1987, Computer Associates acquired BPI Systems, Inc. (Austin, TX). BPI markets business management software for microcomputers.

Also in May 1987, Computer Associates acquired L & L Software, Inc. (McLean, VA), a vendor of minicomputer-based job cost accounting systems.

In July 1987, Computer Associates introduced project management software products for Apollo workstations. The company also announced a cooperative marketing agreement calling for the joint merchandising of Computer Associates graphics and project management software packages that have been specifically developed for Apollo's workstations.

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In August 1987, Computer Associates acquired one of its major competitors, UCCEL Corporation (Dallas, TX). UCCEL is a major vendor of systems software and banking applications software. The merger established Computer Associates as the biggest independent software vendor.

d. Future Direction

The merger of Computer Associates and UCCEL has created a software giant. Yet according to Computer Associates chairman Charles B. Wang, "We still think of ourselves as a small company. We want to be a one-stop software company." Wang adds that he doesn't have a grand design to move into specific markets. What he does have is a grand model. If a company fits in, it becomes an acquisition possibility.

4. Comshare, Inc. (3001 South State Street, Ann Arbor, Michigan 48108)
Revenue (FYE 6/30/87): $70.2 million

a. Products/Services

Comshare develops and markets management productivity software and services. The company's major software products are System W for decision support systems and management accounting applications, Commander for executive information systems, and Profiles for human resource information systems.

Comshare's major product lines are focused on the needs of business managers and executives, and enable users to analyze financial and operating data for performance analysis and decision making.

System W is used for management accounting applications such as budgeting, planning, modeling, forecasting, analysis, and reporting.

Commander EIS (executive information systems) is designed for the information needs of senior managers and executives.

b. Company Strategy

Comshare is continuing its transition from timesharing services that in fiscal 1982 accounted for 92% of revenues. In fiscal 1987, software products and professional services accounted for 56% of revenues (2% in fiscal 1982) with timesharing processing providing 43% of revenues.

c. Recent Activities

In June 1987, Comshare announced the Commander Executive, a PC-based software product for managers and executives. Commander Executive is an addition to the Commander EIS product line.

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In September 1987, Comshare and Dow Jones News/Retrieval (New York, NY) announced a joint marketing and development agreement that will provide Comshare's Commander EIS with easy access to Dow Jones News/Retrieval's business and financial information services.

d. Future Direction

Comshare will focus its efforts on serving the executive information and decision support markets.

5. Execucom Systems Corporation (9442 Capital of Texas Highway North, Austin, Texas 78759)

a. Products/Services

Execucom designs and markets decision support systems software for nontechnical business professionals. The company focuses on senior managers and executives in the areas of finance, corporate planning, information centers, and data processing.

Execucom offers software products for mainframes, minicomputers, and microcomputers. The company's products includes IFPS/Plus, IFPS/ Personal, Corporate Decision Support System, Impressionist, and Mind-Sight.

b. Company Strategy

Execucom intends to maintain its leadership position in the decision support arena by continuing to enhance IFPS and to develop applications for a wider range of hardware platforms.

c. Recent Activities

In January 1987, Execucom and Digital Equipment Corporation established a joint marketing program to promote Execucom's financial planning and decision support software and Digital's hardware.

In February 1987, Execucom announced the release of IFPS/Plus 3.0, a version of its corporate decision support software. This version features a natural language interface and integrates artificial intelligence with business planning functions.

In November 1987, Execucom and Natural Language Incorporated (Berkeley, CA) announced a joint marketing agreement calling for Execucom to incorporate NLI's Data Talker natural language technology in Execucom's product line.

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6. Lotus Development Corporation (55 Cambridge Parkway, Cambridge, Massachusetts 02142)
Revenue (FYE 12/31/86): $282.9 million

a. Products/Services

Lotus develops and markets a line of software products and information services focused primarily on the needs of personal computer users. In addition to its well-known spreadsheet software product 1-2-3 and Symphony, Lotus offers over 20 other products.

b. Company Strategy

Lotus is implementing a building-block approach to acquisition and internal development that leverages the success of 1-2-3 and opens up new products and markets.

c. Recent Activities

In March 1987, Lotus and MCI Communications Corporation (Washington, DC) announced the first shipment of Lotus Express for MCI Mail, a communications software product that enables personal computer users to exchange messages and send telexes.

In April 1987, Lotus announced versions of 1-2-3, Symphony, Freelance Plus, and Lotus Express for the IBM Personal System/2 series of personal computers. Also in April 1987, Lotus and IBM signed a ten-year joint marketing and development agreement for a series of Lotus and IBM products for use on both microcomputer and mainframe systems.

The first such product will be 1-2-3/M, a mainframe-based version of Lotus 1-2-3, which will be marketed by both companies but sold exclusively by IBM.

In addition to cooperating on spreadsheet applications, Lotus and IBM will explore a range of business applications, including data base applications compatible with the industry standard Structured Query Language (SQL).

In May 1987 Lotus and Toshiba America, Inc. (Tustin, CA) signed a joint marketing agreement to sell Lotus's Symphony with Toshiba's 3100-20 portable personal computer.

In July 1987, Lotus announced that it would acquire Datext (Woburn, MA), a provider of business reference information delivered on optical disk (CD ROM) storage media.

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In August 1987, Lotus completed the acquisition of Computer Access Corporation (Belmont, CA), a maker of text-search and retrieval software for microcomputers.

In October 1987, Lotus began shipping Lotus Graphunter II, an automated charting system for producing charts created from spreadsheet or data base data.

Also in October 1987, Lotus announced that it would develop a new version of 1-2-3 for Apple's Macintosh family of personal computers.

In November 1987, the company introduced Lotus Agenda, software designed to help users manage personal information such as notes, messages, reminders, and addresses. Lotus hopes to establish a new application area, personal information management.

d. Future Direction

Lotus will continue to expand its product line to include a portfolio of software products that work as a system that will address the needs of individuals, work groups, and departments. The company will expand its spreadsheet product line to support new operating systems, offer new applications to tie together its various products, and adapt 1-2-3 to mainframe and other large-system computing environments.

7. Metier Management Systems, Inc. (2900 North Loop West, Suite 1300, Houston, Texas 77092)
Revenue (FYE 12/31/86): $85.2 million

a. Products/Services

Metier Management Systems, a subsidiary of Lockheed Corporation (Calabasas, CA) develops and markets turnkey systems, software, and consultancy services for project management applications. The company markets its products and services primarily to the petroleum industry followed by the aerospace, defense, engineering, and construction industries.

The company offers project management software under the trade name Artemis, for minicomputers, mainframes, and microcomputers.

b. Company Strategy

Metier plans to expand into less traditional project management-oriented industries.

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c. Recent Activities

The company has announced development of new applications for Unisys computers. These include Contractor Performance Analysis System (CPAS) and Risk Analysis. CPAS allows users to analyze a contractor's cost performance reports, and Risk Analysis is a scheduling application using probability analysis. These products are due to be released in mid-1988.

d. Future Direction

Metier will expand into new areas including pharmaceuticals, telecommunications, finance, and high technology industries.

8. Microsoft Corporation (16011 North East 36th Way, Redmond, Washington 98073)
Revenue (FYE 6/30/87): $345.9 million

a. Products/Services

Microsoft designs and markets systems software, applications software, languages, and peripherals for microcomputers. The company offers over 40 microcomputer products, including MS-DOS, OS/2, Xenix, Word, Multiplan, Excel, Chart, and Project. The company's applications software products provide for word-processing, spreadsheet, file management, and project management capabilities.

b. Company Strategy

Microsoft plans to extend its leadership in microcomputing operating systems by setting a new software standard with OS/2.

c. Recent Activities

In January 1987, Microsoft announced an alliance with Hewlett-Packard (Palo Alto, CA) and Aldus Corporation (Seattle, WA) to promote a Microsoft windows-based solution for the desktop publishing market.

In April 1987, Microsoft announced the development of OS/2, an operating system for microcomputers that provides for multitasking and exploits the capabilities of Intel's 80286 and 80386 microprocessors.

In June 1987, Microsoft announced a $1 million minority equity investment and product licensing agreement with Natural Language Incorporated (Berkeley, CA). Natural Language's product Data Talker is an English-language interface that allows users to access data bases in plain English.

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Also in June 1987, Microsoft announced Quick C, a compiler and interactive debugger.

In July 1987, Microsoft acquired Forethought, Inc. (Sunnyvale, CA), a developer of personal computer graphics-based applications software.

In August 1987, Microsoft and Altos Computer Systems (San Jose, CA) announced a technology exchange agreement for the development of UNIX/XENIX operating system software.

In September 1987, Microsoft announced Microsoft Windows/386, a version of windows operating environment for 80386-based computers.

In October 1987, Microsoft introduced QuickBASIC 4.0, a software product that combines the features of a compiler and interpreter.

In November 1987, Microsoft announced the release of Microsoft Pageview, a page preview and graphics integration program that works with Microsoft Word to let users preview their documents on screen before printing them.

Also in November 1987, Microsoft announced the shipment of Microsoft Works for the IBM PC. Works is designed for users who perform a variety of general business tasks.

d. Future Direction

Over the next year Microsoft will introduce a variety of new products. The company's goal is to build market acceptance for these products, while preparing the market for the advances represented by OS/2.

9. Project Software & Development, Inc. (20 University Road, Cambridge, Massachusetts 02138)

a. Products/Services

Project Software & Development (PSDI) provides software, consulting, and support services for project management systems. The company focuses on corporations that manage and control large, complex projects.

PSDI's flagship product Project/2 is a comprehensive mainframe and minicomputer project management software product. The company also offers a plant and facilities maintenance software product.

b. Company Strategy

In response to user needs, PSDI has adapted its products for departmental project management. (See Recent Activities.)

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c. Recent Activities

In April 1987, PSDI introduced Quiknet Professional, a project management software program for the IBM personal computer.

In August 1987, PSDI announced that it would offer Project/2 at a lower price, for limited users. Although Project/2 was traditionally priced at $260,000 for unlimited users, a new price of $99,200 was announced for two concurrent users making the product attractive for departmental project management. The software in the repriced package includes Project/2 along with Oracle's (Belmont, CA) relational data base.

d. Future Direction

PSDI's growth has been hampered by a failure to penetrate new markets. Though strong in the utilities and aerospace sectors, PSDI has found it difficult to convince potential users in other markets such as financial services, communications, and pharmaceuticals. The company has become an official supplier of project management software to the 1988 Winter Olympic Games at Calgary, Canada and hopes to leverage this "coup" to penetrate newer markets.

10. Software Publishing Corporation (1901 Landings Drive, Mountain View, CA 94039)
Revenue (FYE 9/30/87): $38.6 million

a. Products/Services

Software Publishing develops and markets business productivity software for personal computers. The company offers several products under its PFS Series including WRITE, FILE, GRAPH, First Choice, First Publisher, and Professional Series. Software Publishing also offers Harvard Graphics and Harvard Total Project Manager II.

b. Company Strategy

The year 1986 was one of transition for Software Publishing. The company's revenues fell to $23.7 million from $37.2 million the previous year. Software Publishing had traditionally sold strongly to small-business users through retail channels and employed only a minimal sales force for direct sales. The company decided to differentiate the market into two segments: traditional consumers and corporate customers. The company created a new product line called the Professional Series to cater to managers and executives. In early 1987 the company launched an advertising and promotional campaign directed toward corporate users. These measures resulted in a rebound for the company, which had revenues of $38.6 million for 1987.

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c. Recent Activities

In February 1987, Software Publishing announced Harvard Total Project Manager II, a microcomputer-based project management system that allows users to plan projects on-screen.

In April 1987, the company announced shipment of the Harvard Professional Publisher, a microcomputer-based desktop publishing program.

d. Future Direction

The company will continue its emphasis on the corporate market segment and will strive to increase market penetration.

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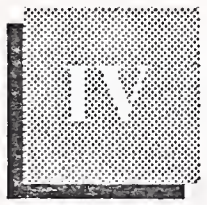

Conclusions and Recommendations

Decision Support Systems: There is ample room for improving today's decision support systems. DSS should be more powerful, more flexible, and more intelligent. Tomorrow's decision support systems should exploit developments in artificial intelligence, data base technologies, and fourth-generation languages.

Executive Information Systems: The EIS market today is in an embryonic stage with few competitors. The major vendors focus on the Fortune 500 with products that cost over $100,000. This leaves opportunities for software vendors to develop micro- and minicomputer-based applications for smaller firms.

Spreadsheets: Spreadsheets should be compatible across micros, minis, and mainframes and should support networks.

Users are looking for more flexible spreadsheets that can be customized for specific applications such as vertical market applications. Software vendors are faced with the dilemma of meeting those needs without diluting their product offerings.

Project Management: Vendors should address the different connectivity aspects. This includes communication between PC and mainframe products from the same vendor, communication between PC and mainframe products from different vendors, and communication between PC products from different vendors.

The market for project management software includes new users, which suggests a broadening appeal to this market. Promising areas are pharmaceutical companies, financial institutions, research and development labs, software development companies, and law offices. Vendors should convince potential users that the real value of project management comes as the experience of the user builds.

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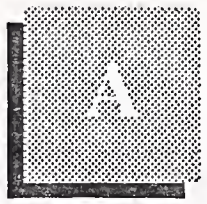

Appendix: Forecast Data Base: Planning and Analysis Sector

This appendix contains the following forecast information:

- Market size by delivery mode for each year from 1986 to 1992
- Market growth rates for 1986 through 1987
- Average annual growth rate (AAGR) for each delivery mode for the five-year period 1987-1992

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EXHIBIT A-1

PLANNING AND ANALYSIS SECTOR
CROSS-INDUSTRY USER EXPENDITURE FORECAST, 1987-1992

SEGMENTATION BY DELIVERY MODE	1986 ($M)	1986-1987 Growth	1987 ($M)	1988 ($M)	1989 ($M)	1990 ($M)	1991 ($M)	1992 ($M)	AAGR 1987-1992 (%)
Remote Computing/ Batch Services	235	0	235	239	235	234	232	229	-1
Applications Software									
Mainframe/Mini	663	11	735	838	944	1,050	1,164	1,273	12
Micro	775	16	896	1,012	1,121	1,306	1,444	1,546	12
Total Applications Software	1,438	13	1,631	1,850	2,065	2,356	2,608	2,819	12
Turnkey Systems	266	7	284	299	321	342	353	370	5
Cross-Industry Total	1,939	11	2,150	2,388	2,621	2,932	3,193	3,418	10

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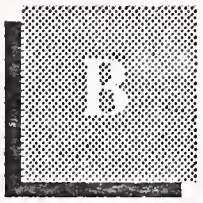

Appendix: Forecast Reconciliation

This appendix contains the following information:

- The changes made in this year's forecast as compared to last year's.
- An explanation of any significant changes that were made to the forecasts.
- The forecasts for turnkey systems were reduced because users increasingly prefer using existing or industry-standard hardware to give them greater flexibility in choosing a software vendor.

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EXHIBIT B-1

PLANNING AND ANALYSIS SECTOR—DATA BASE RECONCILIATION OF MARKET FORECAST, BY DELIVERY MODE

DELIVERY MODE	1986 MARKET			1991 MARKET			1986-1991 AAGR Forecast in 1986 Report (Percent)	1986-1991 AAGR Forecast in 1987 Report (Percent)
	1986 Forecast ($ Millions)	1987 Report ($ Millions)	Variance as a Percent of 1987 Report	1986 Forecast ($ Millions)	1987 Forecast ($ Millions)	Variance as a Percent of 1987 Forecast		
Remote Computing/ Batch Services	250	235	6	225	232	-3	-2	-1
Applications Software								
Mainframe/ Mini	663	663	0	1,076	1,164	-8	10	12
Micro	775	775	0	1,445	1,444	0	13	12
Total Applications Software	1,438	1,438	0	2,521	2,608	-3	12	12
Turnkey Systems	266	266	0	425	353	20	10	5
Cross-Industry Segment Total	1,954	1,939	1	3,171	3,193	-1	10	10

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About INPUT

INPUT provides planning information, analysis and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, communications, and office products and services.

The company carries out continuous and in-depth research. Working closely with clients on important issues, INPUT's staff members analyze and interpret the research data, then develop recommendations and innovative ideas to meet clients' needs. Clients receive reports, presentations, access to data on which analyses are based, and continuous consulting.

Many of INPUT's professional staff members have nearly 20 years experience in their areas of specialization. Most have held senior management positions in operations, marketing, or planning. This expertise enables INPUT to supply practical solutions to complex business problems.

Formed in 1974, INPUT has become a leading international planning services firm. Clients include over 100 of the world's largest and most technically advanced companies.

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The APPENDICES, which include INPUT's definitions, the forecast data base, and the forecast reconcilation, were included as part of the Executive Overview.